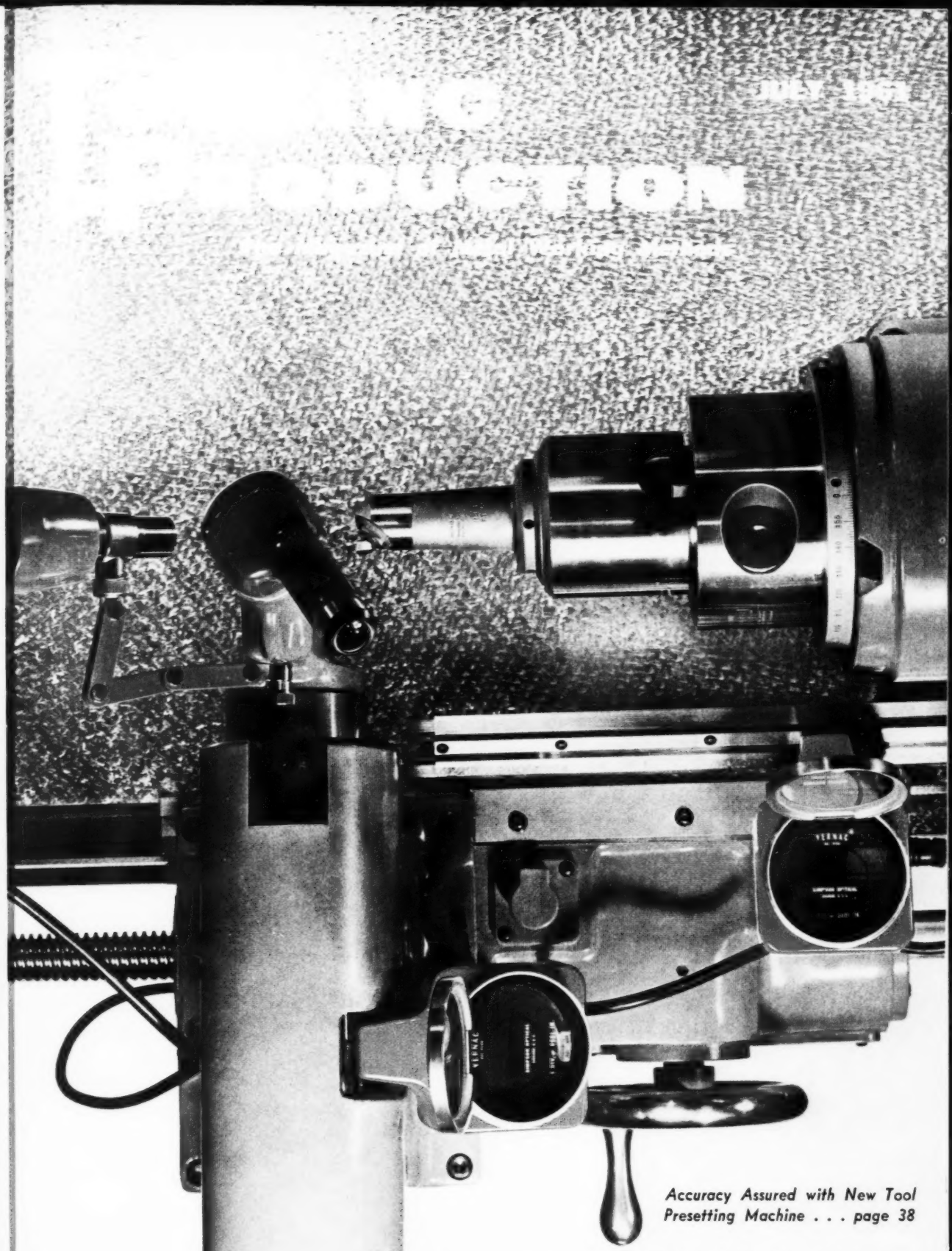

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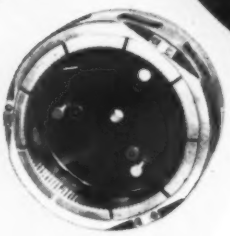
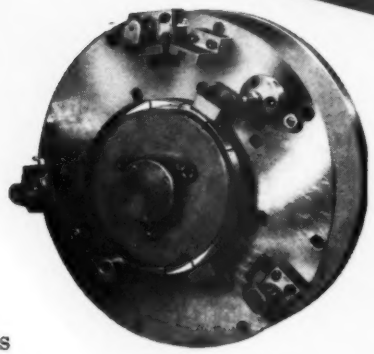
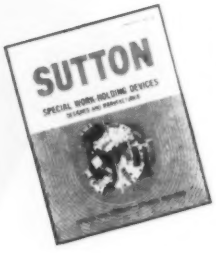
Complete Table of Contents . . . Inside Cover

Tool Engineers Bring Tough Work-Holding Problems to SUTTON





Manufacturers, including many Machine Tool Builders, depend upon Sutton engineers to solve their tough work-holding problems. Special chucking requirements receive the full attention and resources of Sutton engineering specialists and the facilities of its ultra-modern plant.



Submit part print to Sutton for preliminary design and for prompt quotation.
20-page catalog shows many special chucks by Sutton. Write for copy of Bulletin No. 70.

Sutton Tool Company, Dept. TP-7 Sturgis, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. 27, NO. 4

JULY 1961

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Ray Huebner, Publisher

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Ceramics Do The Job . . . When Used Properly 30

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Accuracy Assured With New Tool Presetting Machine 38

The Cover Story

An optical system that allows quick and easy bore diameter and length setting to 0.0001.

Turn over for additional Contents

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A Closer Look At Retrofitting **39**

by Peter D. Tilton

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Vol. 27, No. 4 George J. Huebner, Founder 1885-1956

TOOLING & PRODUCTION MAGAZINE

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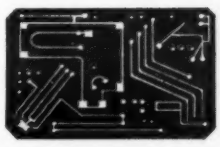
*3-phase motor available



One company has drilled 120,000 #54 holes per carbide tool grind in 1/16" glass epoxy printed circuit boards, stacked 5-high, with higher quality results.

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CIRCLE INFORM-A-GRAM KEY NO. 4

personally speaking...

Dear T & P Reader:

On June 1st the National Machine Tool Builders' Association held its 59th spring meeting. The locale was Washington, D.C. The meeting was addressed by an impressive group of seven dignitaries from Government. There were talks by these Government men, and they represented the Air Force, the Department of Commerce, Internal Revenue Service, the Office of Civilian and Defense Mobilization, the Export-Import Bank, the Small Business Administration, and the International Cooperation Administration.

All of these men talked about things that were directly connected, of course, with their activities and responsibilities. Virtually all of them reiterated the well known fact that our over-all industrial plant in the United States is badly in need of up-dating. The audience heard many times that this is a very positive conviction of President Kennedy and the Administration. Up-dating of our industrial plant is needed for defense. Similarly, it is needed for the sake of improving our competitive capabilities and our economic status.

Since these men were addressing a collection of suppliers of capital equipment, the audience, I am sure, was waiting to hear about some definite and significant plans which Government would advance to urgently motivate industry to modernize production capabilities. All the Government executives acknowledged the desirability of providing such motivation, and many of them discussed possibilities of such motivation being provided. Unfortunately, all the men who talked were administrators. They have nothing to do with making up the rules. Their prerogative is to see that Government, and business, and people live up to those rules.

Changing the rules, for example, on depreciation to motivate your company to retire old equipment and buy new in its place, is up to Congress, and I am sure that a couple of key committee chairmen from the House and the Senate would have been welcome if they would have described something that actually is being done in Congress to solve this problem of revising depreciation rules. A recent letter from Fred A. Hartley, Jr., Co-Chairman of the Conference of American Small Business Organizations, says, "Even the lately-proposed piddling-small increase in depreciation allowances is 'socialistically-small'—far less than industry needs." So it does appear that nothing of significant importance is going to come out of this session of Congress to speed up the modernization the National Administration says our industrial plant needs.

Of course, under the present rules there still are many things you can do to modernize your plant. Have you checked the status of your plant's capital equipment lately? What is the average age of your machine tools? How old is the oldest? How much can you improve your operations by acquiring modern machines to replace the oldest ones you have still in service? Why not check into this matter now and do something about it rather than waiting until your competition forces you to do something?

Do not overlook considering numerically controlled machine. If you can use them effectively, you cannot afford NOT to buy them, and by some means or other you can finance their purchase.

Cordially yours,

Ray Hackner

Publisher

62 435G CL 210

VR-65 faces stainless steel plate to 3-5 micro-inch finish for Goulds Pumps, Inc.

Grade VR-65 is maintaining a 3 to 5 micro-inch finish with superb tool life on a "316" stainless steel thrust plate for Goulds Pumps, Inc., Seneca Falls, New York. This very high "grind" finish is necessary to prevent excessive wear on the graphite part that bears against the plate in Goulds "Nuclear Canned Pump."

The plate is faced at 1220 rpm on a Hardinge Precision Chucker. The sfpm is 300 at the $1\frac{5}{16}$" inside diameter and increases to 765 at the $2\frac{3}{8}$" outside diameter. Feed is .0009" per revolution and depth of cut is .003". VR-65 produces twice as good a finish in half the time with six times longer tool life per grind than the previous method.

Performance such as this puts VR-65 in a class by itself. On your next machining problem, ask your V-R representative about VR-65 or other cutting tools in V-R's complete line.

CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

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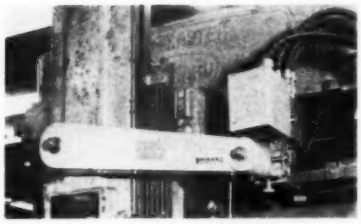
CIRCLE INFORM-A-GRAM KEY NO. 5

Tracer Control Conversion Simplified

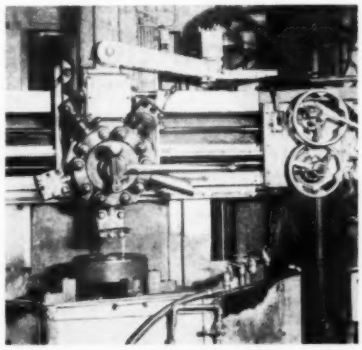
Scan-O-Matic is the name Bansbach Machinery Co., Inc., gives its new 180° or 270° tracer control attachment for machine tools. They claim the system can be attached to any screw-feed or feed-rod controlled machine, such as vertical turret lathes, engine lathes, milling machines, shapers and planers. It's shown here mounted to a 36″ Bullard Cutmaster vertical turret lathe.

Installation of the Scan-O-Matic doesn't modify the machine in any way, and converting from trace to normal machine operation is reportedly accomplished in a few seconds. Conversion requires only the simple connecting of hydraulic motors to machine screws.

A stationary template holder mounts to the machine rail, and the valve stylus moves longitudinally across the template. The patented hydraulic coordinator valve meters fluid to the motors, causing a constant cutting tool feed rate through a possible 180° to 270° of travel. This encompasses both right and left hand 90° straight walls.



Spool of the coordinator valve oscillates 100 cycles/min, resulting in a light stylus pressure and constant stylus deflection regardless of the amount of oil being metered to the hydraulic motors. Thus, repetitive accuracy is assured as the valve will respond and repeat within 0.0002. For complete information on the attachment, write to Bansbach at 1037 Madison St., Oak Park, Ill., or circle Inform-A-Gram No.



This new bench type punch press has five tons of power for punching, forming, shearing, marking, riveting, staking or embossing. Single stroke cycling, 150 s.p.m., or continuous operation, 210 s.p.m. Deep 12 inch throat allows working to center of 24″ sheet. Spring loaded material stripper—easy to set up—ideal for women operators or inexperienced help. Standard equipment includes motor, brake, flywheel guard, all electrical connections, punch holder, stripper assembly and die holder.

PRECISION PUNCHES AND DIES—Over 500 sizes of single station Di-Acro punches and dies are available from factory stock, plus adjustable punches and dies for multiple punching in one operation.

HAND OPERATED PUNCH PRESSES—Di-Acro Punch Presses No. 1 and 2 both provide 4 tons of power that will punch holes up to 4″ round in 16 ga. mild steel using punches with shear. No. 1 has 6¼″ throat depth and No. 2 a 12¼″ throat depth. Both models come with short handle, long handle for heavier materials, punch and die holders, turret stripper; back and side gauges.

Consult the yellow pages of your phone book under Machinery: Machine Tools for the name of your nearest distributor or write us.

See complete Di-Acro line in Sweet's Machine Tool Catalog

pronounced "die-ack-ro"

di-acro PRECISION METALWORKING EQUIPMENT

DI-ACRO CORPORATION
formerly O'Neil-Irwin Mfg. Co.
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Lake City, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 6

Coming Events

June 28-30 Joint Automatic Control Conference, (ASME, ISA, AIEE, AIChE), University of Colorado, Boulder, Colo.

July 18-20 Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

July 24-28 Chicago Association of Commerce and Industry — World Marketing and Inter-American Industries Conference in conjunction with the International Trade Fair July 25-August 10, McCormick Place, Chicago Ill. One category features machine tools.

August 15-17 Cryogenic Engineering Conference, University of Michigan, Ann Arbor, Mich.

the precision
cutting tool system
with built-in
micrometer vernier
adjustment

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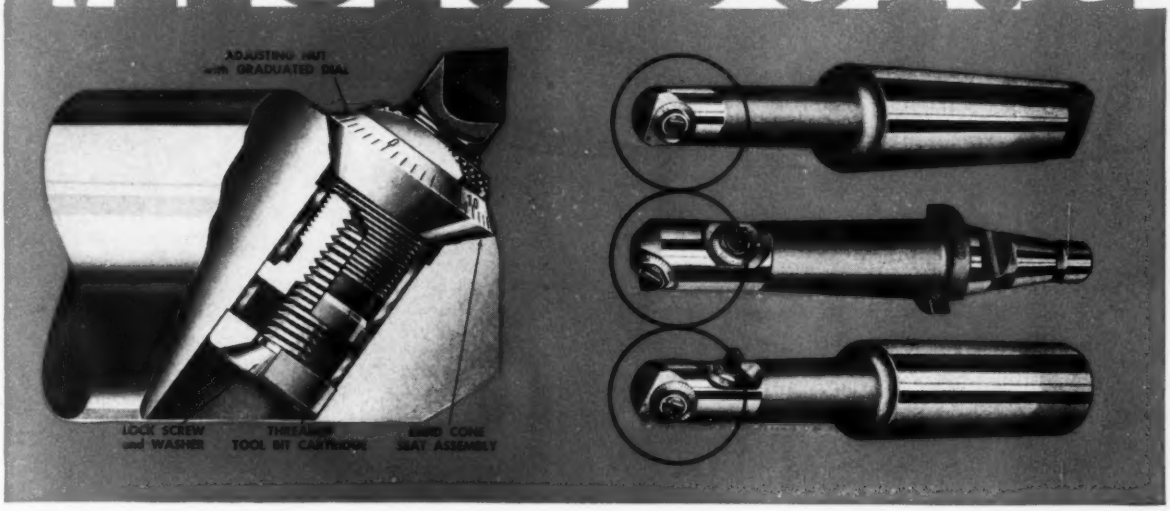

Patented micrometer vernier adjustment! That's the exclusive feature that makes DeVlieg MICROBORE cutting tools so fast and easy to set. It's the built-in feature that eliminates trial and error cuts; reduces machine downtime and rejects. Micrometer vernier adjustment is also the feature that makes it easy to achieve accuracies impossible or extremely difficult to arrive at with conventional tooling. But that's only part of the story! Write for complete information on MICROBORE. Introduce yourself to a system of multipurpose tooling designed to deliver the utmost in precision and production from today's high performance machine tools.

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DEVLIEG MICROBORE SYSTEM

CIRCLE INFORM-A-GRAM KEY NO. 7

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222

In shop talk you're "on the money" with Universal drill bushings. You're "in the money" with savings, too. Universal drill bushings save tools because they have super finished bores, blended radii and 100% concentricity. They wear longer and are easier to change due to their knurled heads. All standard sizes and lengths available for immediate delivery.

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CIRCLE INFORM-A-GRAM KEY NO. 8

SERIES M FRICTION CLUTCH OBI

Already in the field and on the job in substantial numbers, the new Series M is drawing a very significant response from production people. Here, briefly, are the features generating the most comment:

EXTRA RUGGED, NEW WELDED STEEL FRAME . . . surpasses in stiffness even the high standards by which Niagara OBI's have been known for years. Dramatically less vertical and angular deflection prolongs die life, assures uniformity of work.

FULLY ENCLOSED DRIVE . . . improves safety factor by eliminating exposed rotating parts. Front guard shields operator from oil splashes.

COMPACT BUILT-IN PRESS CONTROL . . . assembled with the latest in compact components. Nothing protrudes.

SLOW, LOW ENERGY, POWER-OFF JOGGING . . . When in "Jog" position, the Selector Switch *disconnects main motor.* Pressing 2 palm buttons (both hands) brings slide down slowly and smoothly. A separate motor jog button permits small shots of energy to be restored to flywheel as required. Die-setting is easier, faster, safer.

EXTRA LONG, RIGID SLIDE . . . prevents deflection of guiding ways. Exceptionally generous front-to-back mounting space, with mounting holes in front, rear, and sides, gives dies more solid support. New design provides for circulating oil and keeps oil out of die area.

Niagara Series M OBI Presses are available in 4 sizes (both non-geared and single geared) with shaft diameters from 2½" to 4" and capacities from 22 to 60 tons. A specialized design is built for automatic ultra high speed production. For the full story, send today for Bulletin 54. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices and Distributors Everywhere.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE INFORM-A-GRAM KEY NO. 9

On these pages you'll find the number of the FELLOWS gear inspection instrument that precisely matches your needs.

In fact, right from the gear blank to the finished external or internal spur or helical gear, FELLOWS has a complete line of gear production *and* inspection equipment.

One of the most important FELLOWS developments is the No. 4 Red Liner for fine-pitch gear inspection. It makes "composite" checks on the finest instrument gears with remarkable accuracy and sensitivity. Magnifications of 1600 to 1 are obtained thru the electrical recording system which provides a written, unbiased record for instant reading or for proof-of-accuracy files. It's the *best* way to check tiny gear components such as that shown actual size at top of right-hand page . . . a 22-tooth, 96 D.P. pinion backed up to an 80-tooth gear on a cluster.

WE'VE GOT YOUR

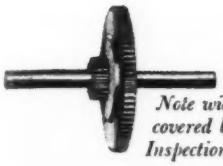
NO. 4 FINE PITCH RED LINER. For composite check of external and internal spur and helical gears. Maximum P.D.– 4″.

NO. 8 RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. depends on design.

NO. 12M INVOLUTE MEASURING. For external and internal spur and helical gears. Maximum P.D. — 12″. No. 24M — 24″ cap.

NO. 20M RED LINER. For complete check of external and internal spur and helical gears. Maximum P.D. — 18″.

Keep *your* production and inspection operations efficient and economical with today's most advanced gear manufacturing equipment. Get complete details on FELLOWS equipment from your nearest FELLOWS branch office.



Note wide range of size covered by Fellows Gear Inspection Equipment.

NUMBER!

NO. 12H LEAD MEASURING. Continuous-originating type lead measuring of external and internal helical gears. Maximum P.D. —12". No. 24H has 24" capacity.

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Branch Offices:
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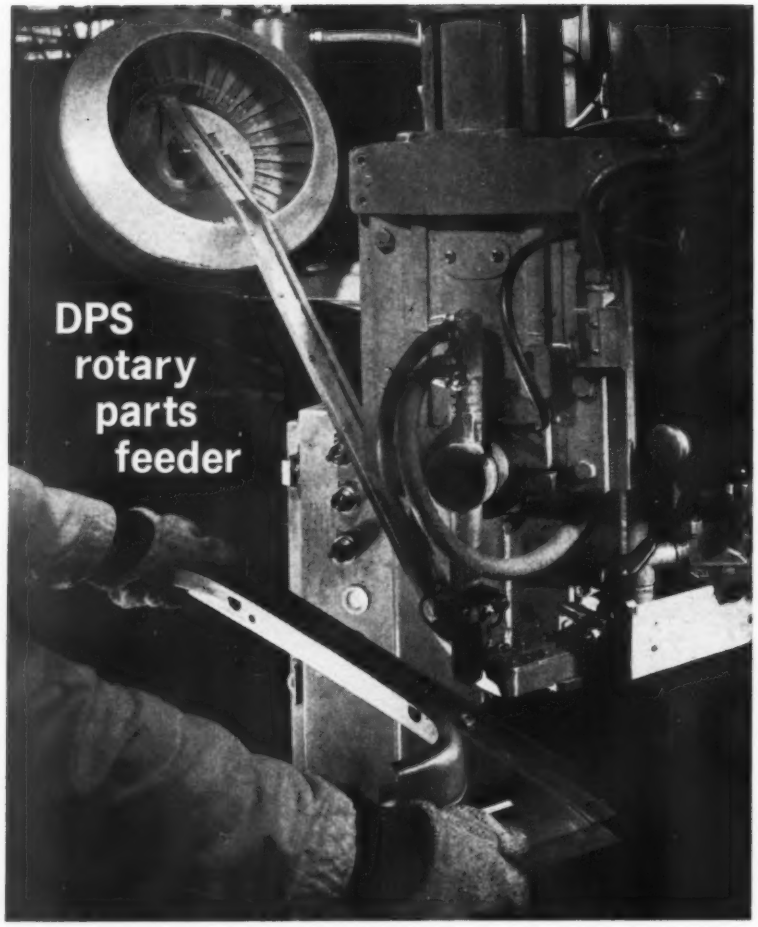
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

THE PRECISION LINE

Fellows

Gear Production Equipment

CIRCLE INFORM-A-GRAM KEY NO. 11



doubles nut welding output in sub-assembly production line

In this sub-assembly operation, production of the welding equipment was limited because the weld nuts had to be hand positioned. When the DPS rotary parts feeder took over the feeding operation, nut welder output was doubled.

Savings and efficiencies such as this are being effected in assembly operations throughout industry. Parts of a variety of sizes, shapes and materials are successfully being handled in DPS rotary, vibratory and elevating type parts feeders . . . industry's most complete line. Parts ranging from common bolts, nuts and screws to the many more unusual pieces that are used in the complex machinery of today.

DPS engineers welcome the opportunity to work with your engineers in analyzing assembly problems and production line procedures. They will recommend the one best feeder to effect lower manufacturing costs and improved product quality. Write or call today. Ask for free catalog.

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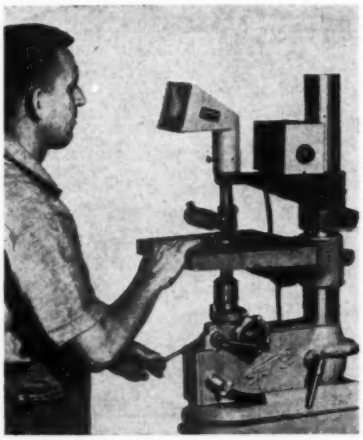
Drill Printed Circuit Boards More Accurately



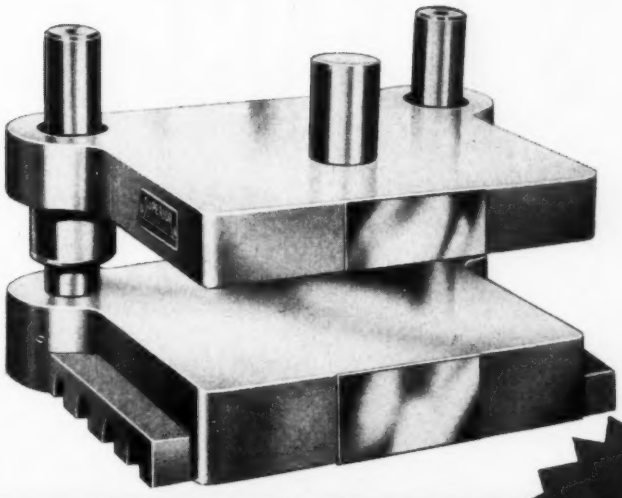
A new optical system to aid in drilling holes in printed circuit boards provides positive accuracy, simplified production, and elimination of most rejects. The Stocker & Yale No. 33 optical package can be fitted to many standard drill presses for precision drilling.

The drill head is reversed so that the drill can be fed upward, and a drill bushing is fitted to the underside of the work table. The optical projector and accessories are mounted on an arm which can be adjusted vertically on the drill column for focusing.

In operation, the cross lines of the optical screen are first lined up with the drill point. After the circuit board having a preprinted hole pattern is placed on the work table, the printed dot for the hole to be drilled is projected and centered on the cross lines of the screen. Then the board is clamped down and the drill is fed up through it . . . precisely where desired.

With a choice of magnification from 10X to 100X, the required degree of accuracy is easily attained. For further information, write to Stocker & Yale, Inc., 44 Green St., Marblehead, Mass., or Circle Inform-A-Gram No. D1.

The Inform-A-Gram Card is for your convenience in making inquiries about Advertised Products and Editorial items.



SUPERIOR DIE SET Exclusives

SAVE TIME AND CUT OVERALL DIE MAKING COSTS!!

No fumbling or wasted time with large or small die sets when you use Superior. Assembly and disassembly of these precision sets is rapid. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging valuable press equipment.

All Superior Die sets are jig bored to your specifications—result number of die set sizes practically limitless.

Add to this such outstanding features as *Precision Center Marks, Long and Short Bushings, Superfinish Pins* and you can see why Superior is your best die set buy.

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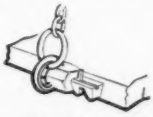
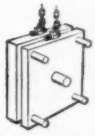
SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe.



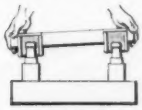
LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets.



E-Z LIFT SLING CHAIN

attach to the lock-jaw for immediate lifting.



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SUPERIOR
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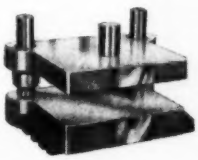
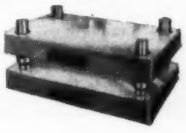
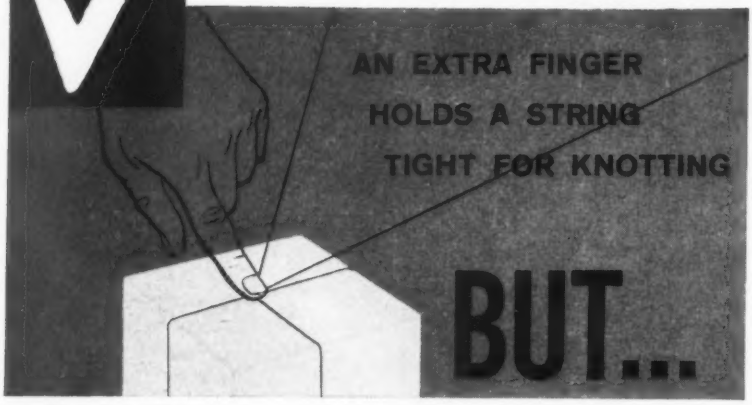




CIRCLE INFORM-A-GRAM KEY NO. 13

IT'S A FACT



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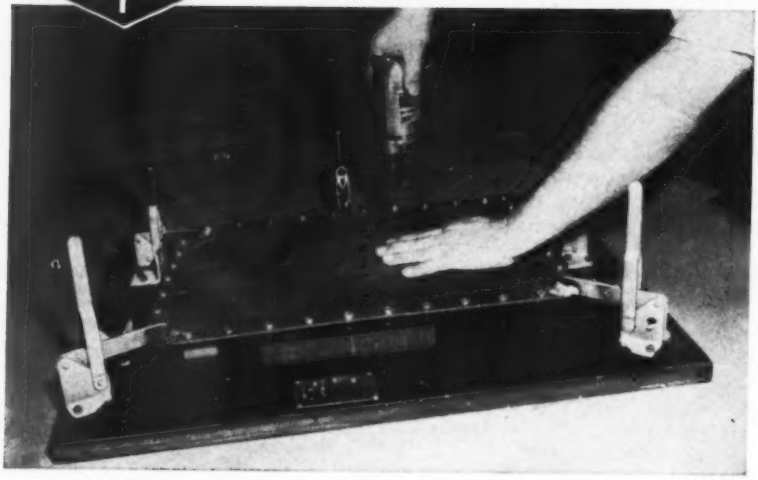

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CIRCLE INFORM-A-GRAM KEY NO. 14

Tap Performance

Recent British research turned up evidence of little significant difference in the performance of small diameter HSS taps with rakes in the 0° to 15° range, when tapping low carbon steel. The conclusion, however, was to recommend holding the rake in each flute at approximately 3°.

A slight improvement in tap performance was noted at 3° rake. Where load is a factor, edge strength at this value favors it over higher rake angles. Also, this low rake permits more regrinds of the tap flutes.

The most satisfactory tool life was experienced with taps having 60% flute area on the major diameter. While good life was obtained with 40 to 60% flute area, the recommendation is to start with an initial 40% flute area and increase it accordingly through subsequent regrinds up to 60%.

The full 24-page report, No. 42, on "Performance of Taps," may be obtained from Production Engineering Research Assn., Melton Mowbray, Leicestershire, England. The price is 7/6d, or $1.05.

Dictionary Revised

INTERNATIONAL DICTIONARY OF PHYSICS AND ELECTRONICS, published by D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N.J., 1961, 1355 pages, $27.85.

This new second edition, enlarged and extensively revised, covers a range of subject areas from general principles through acoustics, to atomic and nuclear physics, and carries essential indices in German, Russian, French and Spanish.

This revision appears only 5 yrs after the original dictionary, but was necessary, according to the editors, because of the rapid progress in some fields of physics and electronics. They single out these as the significant progress areas: the breakdown of parity conservation, the growth of hydromagnetics and other forms of fluid mechanics, the completion of more powerful accelerators, the rapid application of transistors, and the increased quality and quantity of computers.

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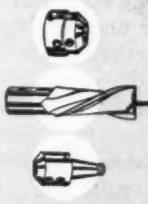

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Making Management a Science

THE MEASURE OF MANAGEMENT, by Eliot D. Chapple and Leonard R. Sayles. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N.Y., 1961, 218 pages, $6.50.

"... to develop a consistent and generally applicable system of measurement so that the executive can describe the personality of a fellow manager, elements in the organization structure, and the work flow pattern of his department 'in the same language.'" This is one of the objectives of this valuable book, which is an outgrowth of the continuing research interest of the Columbia University Graduate School of Business in the field of human behavior in organizations.

Authors Chapple and Sayles are adjunct professor of management and professor of management, respectively, at the Columbia graduate school, and as consultants also have intimate knowledge of business and industry.

Their book is an important step in translating the management function into a science.

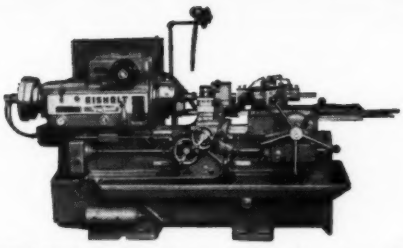
Basic Text Revised

THE MACHINING OF STEEL, second edition, by F. C. Lea and E. N. Simons. Distributed by The MacMillan Co., 60 Fifth Ave., New York 11, N.Y., 1961, 208 pages, 21 shillings.

This revision of an earlier British text is heralded as "a simple explanation of the principles and practice of turning, planing, shaping, milling, drilling, broaching, reaming and sawing." It doesn't consider grinding because the subject "would have been difficult to cover without making the book unwieldy," according to Mr. Simons' introduction. Mr. Simons also states there that the book endeavors throughout to meet the needs of the practicing machinist and the student in his undertaking of the basic considerations in the working of steel.

Two appendices treat developments since the first edition — machining manganese steels, and electro-spark cutting.

SOMEBODY *is doing it for* LESS



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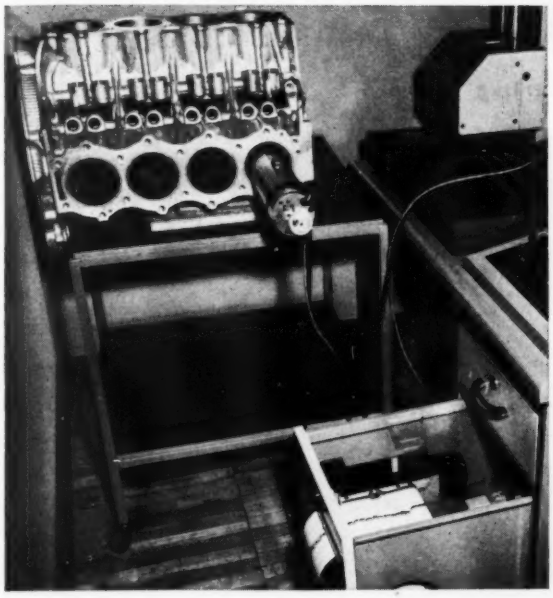
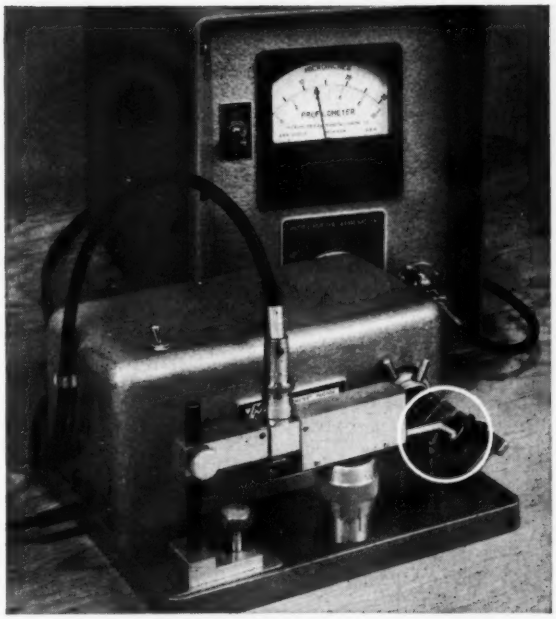
BREAKING MEASUREMENT BARRIERS WITH MICROMETRICAL



SHOWS CYLINDER WEAR: HOW MUCH and WHERE

PROBLEM: To determine (1) the surface texture obtained inside cylinder bores from various production processes, and (2) the amount and location of cylinder wear after trial runs. SOLUTION: Obtain magnified profiles of the surface—tracing lengthwise with a Proficorder® Internal Linear Pilotor inside the cylinders as shown at left. The pen-drawn profiles show the height and width of waves, steps, flaws, wear and roughness irregularities.

For more about the Proficorder, ask for BULLETIN LT24.



ROCKABYE RIG REPORTS ROUGHNESS

Production-checking the roughness of a recessed concave spherical surface is a cinch with the Profilometer® equipment at right. The Pilotor "rocks" the work-piece in an arc to move the surface back and forth beneath the Tracer point, while the meter shows the roughness in microinches. BULLETIN LT126 gives details.

There's Profilometer equipment for measuring the roughness of practically ALL machined and finished surfaces—quickly, dependably, in the shop. For features and applications ask for BULLETIN LT14.

MEASURES BALL BEARING NOISEPOWER

A company making electric motors found that ball bearings were a frequent cause of noise and vibration; and testing bearings by sound or touch failed to weed out the noise-makers. They licked this problem with the Anderometer® (left)—measuring all ball bearings in receiving inspection for vibration characteristics, and using only those whose Anderon ratings assure smooth, silent running.

BULLETIN LT11 describes the Anderometer. May we send you a copy?

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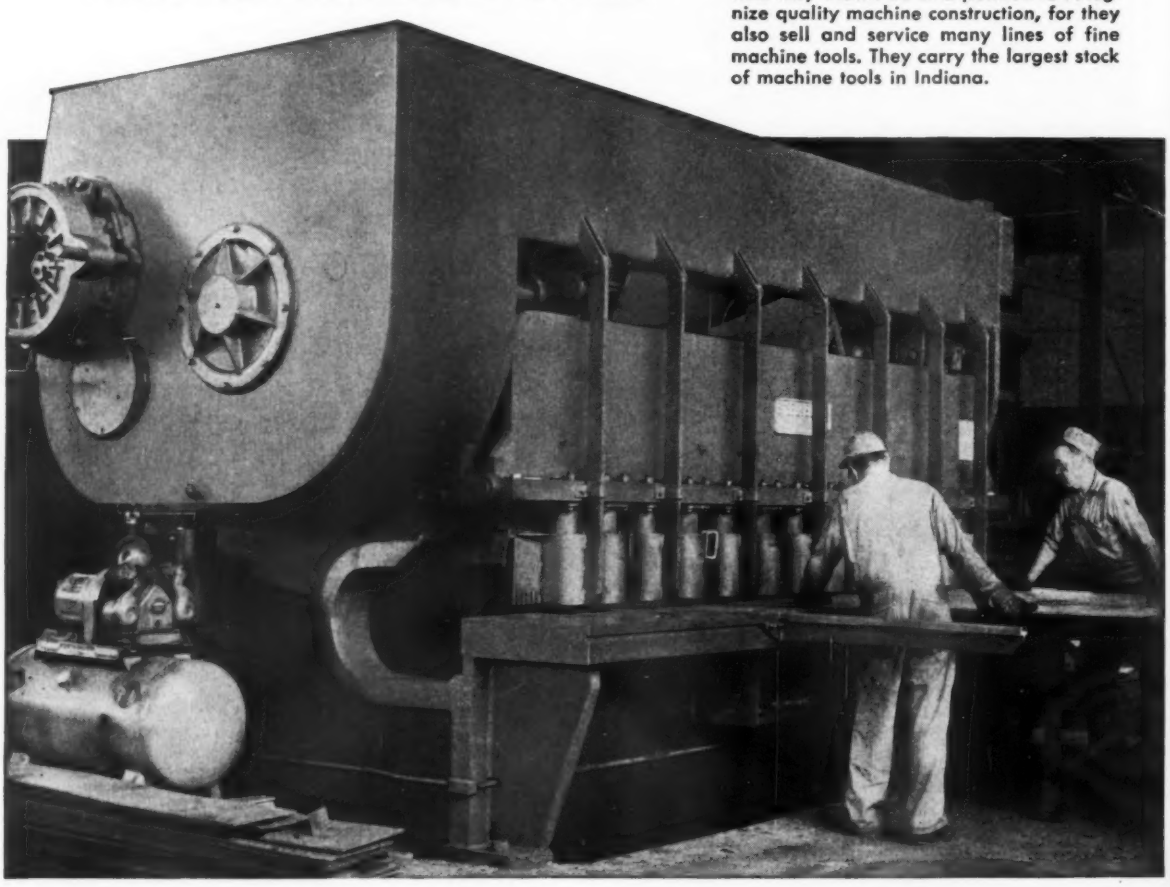
CIRCLE INFORM-A-GRAM KEY NO. 19

STEELWELD SHEAR ENABLES STEEL WAREHOUSE TO PROVIDE DELUXE SERVICE

Indianapolis Supplier Cuts Plates To Suit Customers' Needs EXACTLY

This Steelweld Shear is much appreciated at the Indianapolis Machinery Co., Inc. And they should be in a position to recognize quality machine construction, for they also sell and service many lines of fine machine tools. They carry the largest stock of machine tools in Indiana.



WITH a Steelweld Pivoted-Blade Shear that has been operated continuously in its steel warehouse since 1953, the Indianapolis Machinery Co., Inc., Indianapolis, furnishes metal cut to exactly meet its customers' requirements.

This usually means thicknesses from 3/16 to ¾ inch, widths varying from a few inches to 12 feet and lengths to the maximum available from the mills. The metal may be mild steel, stainless or any of a number of special alloys. Whatever the metal or thickness, the cuts are straight and accurate with negligible burr, because the knife clearance is always adjusted to produce the best results.

Some orders call for strips of type 304 stainless, 5/16 and ⅜ inch thick by 1¾ and 2¾ inch wide. Others call for hard abrasive-resisting steel in strips ⅜ by 2 and 2¼ inches. Because of the shear's very low knife rake angle, such items are made with extremely little twist, camber and bow.

The air-operated clutch and brake have proven phenomenal by customary shear standards. Despite the tens of thousands of times the clutch and brake have opened and closed in making as many cuts over the years, the original linings are still in use. The action continues snappy and positive. The machine has its own air compressor mounted on one end.

Considering the large volume of shearing work done, the knife wear has been long and satisfactory. Knife grindings have been at least a year or more apart. This is attributed to not only the quality of the knives, but to the low rake at which they operate and also the correct knife clearance used for all cutting.

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CIRCLE INFORM-A-GRAM KEY NO. 20

TOOLING & PRODUCTION
The Magazine of Metal Working Methods

Our Working Force 1970-1980

WITH A CHANGING WORKING FORCE, the older and more experienced worker is decreasing in number compared to the multitudes of young people who were born during or since World War II. These young people will fall heir to our industrial facilities. Will there be enough learning time, and background information to draw from, that they may make the proper decisions to handle their inheritance? The answer is: they must, and we must pave the way.

Statistics of the National Industrial Conference Board, set forth in approximate figures, show: 1) 98% of the people in the United States have no adult experience with World War I, 2) 79% have no adult experience with the 1929 crisis, 3) 64% have had no adult experience with World War II. I hope that the Board will someday be able to offer a statistic showing that 100% of our population will have had no adult experience with a war, hot or cold. Certainly, we hope that the world populations will be able to come to certain conclusions as to the proper state of existence, and that this statistic may become a reality.

But what about realities of a similar nature? It doesn't take much thought to realize that our working force, in percentages, is younger each year — it's as inevitable as the population increase, the continuation of the mechanization trend, early retirement, etc.

Perhaps industry has little opportunity to look far ahead, while trying to keep up with the competition, and handling other less sophisticated problems, but we can't trust educators with the whole job of preparing these people.

Formal education is most desirable, but not always practical. Along with this, educators teach from an objective point of view, and this approach is not improving as the tug-of-war continues between industry and schools as they vie for services of teachers.

Suppose we reconsider that much of the trained talent we now have will pass too quickly. Are we using these older people, in some formal way, to thoroughly train their younger counterpart? Or do we have them right in there, supposedly competing on the same type of work?

And then the drive for engineering trainees: it appears to be off a little right now, but it should never be allowed to cool in industry. And what about the balance sheet boys and accountants that run some of our industries? Are they able to appreciate the need now, let alone in the future, for this other very necessary talent? If so will they do anything to help? Or in their "milking" are they preparing to pass only money as an inheritance to their children?

William S. Hoffman
Editor

NEW TOOL STEEL SERVICE

cuts inventory costs

Using too many grades of tool steel can lead to over-stocking—

that's when you need the benefits of Crucible's new Tool Steel Service!

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in quantity—enables you to carry fewer pounds in stock...

gives you a lower price per pound (you eliminate small quantity "extras"),

and with fewer grades to identify, you reduce the possibility of "mixed" steel.

All through standardizing on a few basic steels!

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CIRCLE INFORM-A-GRAM KEY NO. 22

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. 27, No. 4
JULY 1961

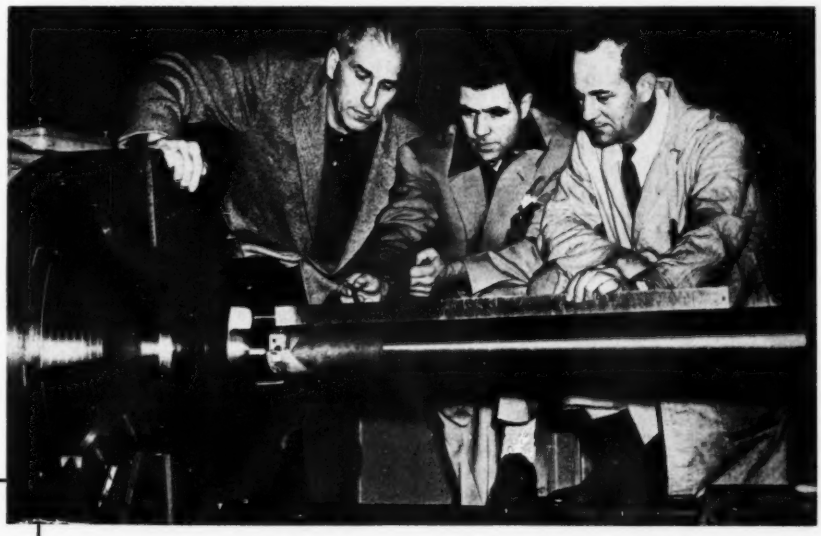
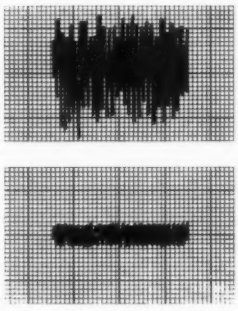


Fig. 1. Until recently, deep cavities had for the most part been finished by the use of a number of successive reamers. Reaming at best is a slow process, and if a number of reamers are used, their purchase and maintenance are costly. Many attempts at boring were unsatisfactory, until the use of carbide bars, to withstand vibration and minimize deflection. Carbide reinforcing strips on steel bars is sometimes used. Oscillograph recording at right (top) shows the vibration obtained on a cut when boring with a steel bar. On the same cut using a carbide reinforced bar the reading below indicates much less vibration.



Carbide Uses
- - - Other Than Cutting Tools

INDUSTRY CONTINUALLY FINDS new uses for carbide because of its outstanding properties. We are repeatedly told applications where performance was limited due to the inabilities of other materials being used.

Properties of carbides are seldom called on to stand alone. For instance, its unusual wear resistance is usually supplemented by its stiffness to good advantage. Advantages most important to the metalworking trade are:

Wear resistance — up to 100 times better than steel

Stiffness — rigidity is two or three times that of steel

Compressive strength — a maximum loading permissible is higher than virtually all melted, cast or forged metals, or alloys

Weight — carbides have a specific gravity nearly twice that of steel

Dimensional stability — little or no change during heating or cooling

Hot strength — ideal if proper grade is applied.

Liquid metal pumps may not be in wide use today, but they very well could be in the near future, where sleeve and plate type thrust bearings will be used as components because of their high resistance to wear and corrosion. It is understandable that special considerations would be required since pumps of this nature handle liquid sodium at 4000 gal/min at temperatures of 1500°F.

Solid carbide components are being used in aviation and missile guidance systems because of their

Information and photographs furnished by Kennametal, Inc.

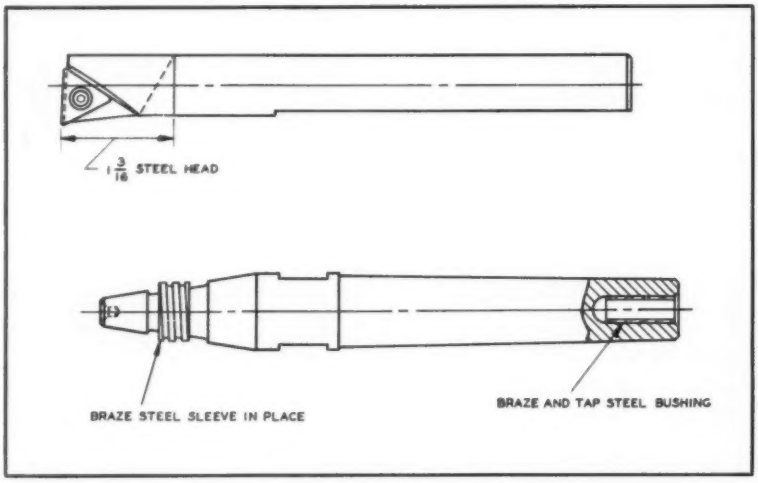


Fig. 2. Two solid Kennametal tools are shown here. A solid boring bar is shown above with its brazed steel head designed to accept the standard carbide insert. Grinding quill is drawn below with two steel inserts brazed in place for ease of manufacture.

high hardness and unusual compressive strength. The ability of the material to take a high polish (on the order of ½ rms) offers parts operation without stiction therefore obtaining extreme accuracy in the operation.

Carbide ball and seat valves operate successfully for years under severe conditions in hydraulic systems. These applications must withstand abrasions, deformation, cavitation, high temperature, and occasionally attack from corrosive agents.

Knurling wheels made of carbide are able to offer fantastic life. In cases where wheel-life had been limited to production of a few parts per wheel when made from steel, are now still producing after a number of years' use when made from carbide. Performance in this area is due to the high edge and compression strength combined with an exceptional resistance to abrasion. One of the important uses of carbides is in swaging dies. The use of carbide wear strips in place of tool steel in many instances increases die life as much as 45 times. In regard to carbide application as applied to dies, the greatest boon to the electric motor in industry was the use of carbide inserts for intricate motor lamination dies.

The same high impact and edge strength properties coupled with high resistance to abrasion are beneficial in percussive and shearing applications. A few of these might be steel strip slitting, cold heading, blanking, punching, gripping, and interrupted cutting as is experienced in machining steel.

The automotive industries with their high production requirements have found the use of carbides in their chuck jaws a blessing.

Excessive delays, due to downtime, on automatic lathes were frequently caused by short chuck jaw life, when made of steel. Now workpieces are chucked by the hundreds of thousands over many months of operation when carbide facings are used on jaws — and at small additional cost.

Again, the resistance to wear and impact, plus high rigidity and compressive strength make hard carbides ideal for many metal forming operations such as swaging. One manufacturer has increased production of alloy rod swaging ten times between die dressings; at the same time he is able to realize greater uniformity and better quality.

It's hard to imagine any machine component more abused than shot blast blades. The life of steel blades whirling the highly abrasive grit was short compared to the use of carbides. In addition to the savings in downtime by not having to change blades and wheels, a more consistent shot-pattern can be had for efficient cleaning and surface preparation.

In recent years the already high rigidity of tungsten carbides have been even further increased by research and development. Over and above this, tensile strength has been increased in order that boring

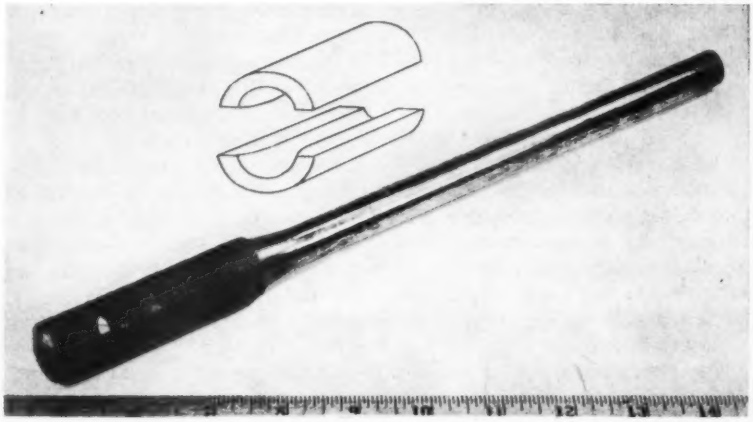


Fig. 3. A steel tool whose taper from one diameter to the other has been swaged in a two-part carbide die is shown above. Swaging is a hammering action where the impact strength of carbide is important. Since the dies actually rotate around the part as they hammer there is considerable wear. Carbide's abrasion resistance makes its application here particularly advantageous.

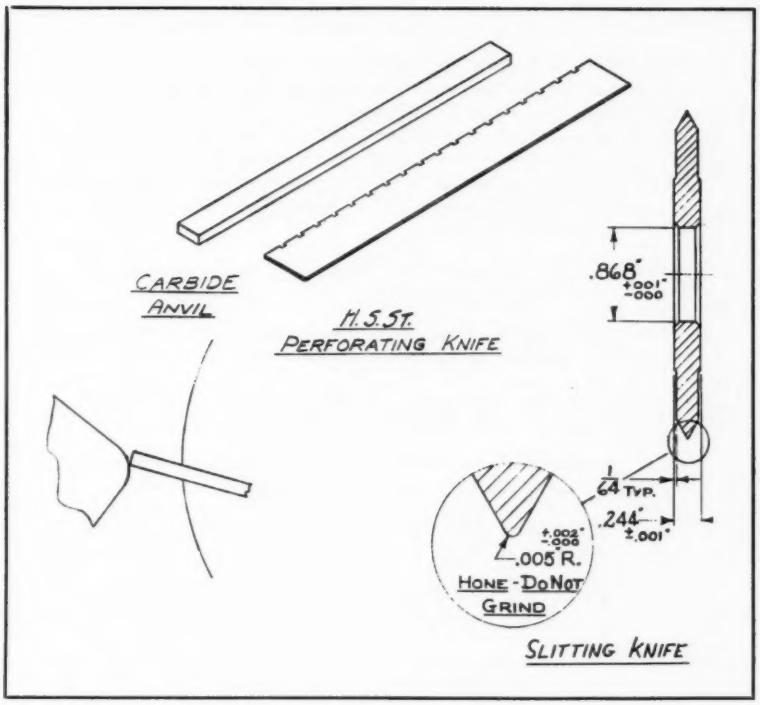


Fig. 4. Here two examples of carbide tooling are applied to the paper industry. On the upper left a solid carbide anvil is used to take the wear of paper and a rotating perforating knife. At the right a circular slitting knife is made of solid carbide.

bars of great length can be fabricated from these materials. The military has had many of their problems solved by the use of carbide boring bars for machining large gun powder chambers. Steel boring bars heretofore used deflected and vibrated, and high speed steel reamers failed to produce the accuracy that carbide bars can offer. In certain instances machine time on difficult boring operations has been reduced more than half the previous time required, and extreme accuracy and consistently fine finish have been obtained. An extra bonus has been the elimination of grinding operations previously necessary. The prime reason for this is the ability of powdered metals to absorb vibration.

Carbide application brings into play erosion resistance necessary to the automotive industry in their flame hardening apparatus. Copper and steel tips heretofore had tendencies to enlarge when using mixtures of propane and oxygen, whereby carbide tips show no appreciable wear after months of service. They require only occasional cleaning and inspection. One old metalworking process that has enjoyed considerable refinement and development in the last few years is that of spinning metal, in which case special machines or lathes might be used for the forming of sheet metal over mandrels. This operation is done either hot or cold, and when performed hot, the carbide spinning tools can best withstand the high temperature and oxidizing involved much better than other materials.

In metalworking, lathe-centers enjoy longer accuracy due to the high resistance to abrasion and non-dulling properties found when this material is used on the tip.

It is interesting that carbide grinding quills like the boring bar applications prove most effective in grinding operations, due to their resistance to deflection.

Also on end-drive-lathes used by the automotive industry, driver pins made of carbide are used to great advantage. For this application steel pins would break each time the turning tool would fail. Now when a turning tool fails, often stopping the part, the driver turns in the end of the part instead of breaking. It is then only necessary to replace the broken cutting tool, replace the scrapped part, and proceed. In a certain instance, six machines equipped with carbide driving pins have saved $1000 a month just from this simple application.

Whether it be impact or other forms of extrusion, high compressive strength and resistance to deformation make it practical to form a variety of parts which cannot be produced economically with steel punches and dies. High compressive strengths in the neighborhood of 250,000 to 450,000 psi are required to produce 35,000 to 150,000 extrusions before reworking punches. Their history, in general, uses many carbide wear parts which can be obtained in stock sizes and shapes. These include standard catalog items such as extruded rounds and flats, discs, rectangular blanks, rods, tubing, plus ground rounds and squares and many other requirements of engineering specifications. ■

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine 1975 Lee Road, Cleveland 18.

THE FIRST FIVE CHAPTERS of this series have dealt with the proper use of *any* replacement formula. Putting the correct figures into the formula and using the answer with proper perspective are far more important than the selection of the formula itself. These chapters have stressed the importance of the shopman's judgment in working out the figures, and have suggested ways this judgment can be applied. Here is what we have covered so far:

Chapt. I How to understand the role of *both* obsolescence and deterioration in replacement.

Chapt. II How to measure obsolescence — the increased production because of the new machine's improved design.

Chapt. III How to measure deterioration — how far the old machine has gone downhill in relation to itself.

Chapt. IV How to put a realistic value on the worth of a man-hour, and a realistic "service life" on the new machine.

Chapt. V How to use the formula's answer in deciding a proper course of action.

No formula will be right unless it is used properly. And it is to that end that the first five chapters have been written.

Machine Replacement For The Shop Manager

Chapter VI - Machine Tools As Investments

by Baxter T. Fullerton
Mr. Fullerton is Director of Marketing Services, The Warner & Swasey Co., Cleveland, Ohio.

THE SECOND PART of this series will present a new type of replacement calculation. This chapter will discuss the mathematical principles involved in the calculation. The next chapter will show how these principles can be applied to an actual case. The final chapter will explain a short cut that will make all the detailed figuring unnecessary.

There may be some rough going in this and the next chapter. We're not dealing with a simple subject. Some of this material will have to be studied rather than read. I think there's information here that will be helpful to you whether or not you ever use a calculation.

A Machine Tool Is An Investment

A machine tool is an investment like a stock, or a bond, or a piece of real estate. You put out your good money for it and you expect a return on your money. Whether it's a good investment or not depends upon how much money it earns compared with how much you could make on your money elsewhere.

This sounds simple enough! To decide on a proposed investment in a new machine, you have to take only three steps, the same three steps you take in deciding on any investment. First, find out how much it will earn; second, find the rate of return; and third, compare this rate of return with rates from other possible investments.

A machine tool, however, is a peculiar kind of investment, and these three steps are not as simple as they sound.

First, what are the "earnings" of a machine tool? They are not coupons to be clipped, interest to be added to your account, or a published earnings statement at the end of the year. Essentially, **machine tool earnings are cost savings.** This is true whether the machine is bought to add to plant capacity or for replacement.

You buy a new machine because you expect to obtain pieces from it at less cost than you could without it. If you buy the machine for expansion, or when you're just starting business, you expect to obtain the pieces at less cost — or more convenience — than if you bought them outside your shop. If you buy the machine for replacement, you expect to obtain pieces at less cost than previously from within your shop.

In either case, the cost savings are the **earnings** of the investment.

Second, what is the rate of return? Unfortunately, you can't just divide the annual "earnings" by the amount of money invested to find the rate of return as you do with other investments. A machine tool is called a **wasting asset.** If you keep it long enough you have no asset left! You wouldn't, for instance, buy a $10,000 machine that will earn only $500 per year. If you did, it would take 20 years just to get your money back.

YEAR \ INTEREST RATE (%)	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30
1	.952	.943	.935	.926	.917	.909	.893	.877	.862	.847	.833	.820	.806	.794	.781	.769
2	.907	.890	.873	.857	.842	.826	.797	.769	.743	.718	.694	.672	.650	.630	.610	.592
3	.864	.840	.816	.794	.772	.751	.712	.675	.641	.609	.579	.551	.524	.500	.477	.455
4	.823	.792	.763	.735	.708	.683	.636	.592	.552	.516	.482	.451	.423	.397	.373	.350
5	.784	.747	.713	.681	.650	.621	.567	.519	.476	.437	.402	.370	.341	.315	.291	.269
6	.746	.705	.666	.630	.596	.565	.507	.456	.410	.370	.335	.303	.275	.250	.227	.207
7	.711	.665	.623	.584	.547	.513	.452	.400	.354	.314	.279	.249	.222	.198	.178	.159
8	.677	.627	.582	.540	.502	.467	.404	.351	.305	.266	.233	.204	.179	.157	.139	.123
9	.645	.592	.544	.500	.460	.424	.361	.308	.263	.226	.194	.167	.144	.125	.108	.094
10	.614	.558	.508	.463	.422	.386	.322	.270	.227	.191	.162	.137	.116	.099	.085	.073
11	.585	.527	.475	.429	.388	.350	.287	.237	.195	.162	.135	.112	.094	.079	.066	.056
12	.557	.497	.444	.397	.356	.319	.257	.208	.168	.137	.112	.092	.076	.062	.052	.043
13	.530	.469	.415	.368	.326	.290	.229	.182	.145	.116	.093	.075	.061	.050	.040	.033
14	.505	.442	.388	.340	.299	.263	.205	.160	.125	.099	.078	.062	.049	.039	.032	.025
15	.481	.417	.362	.315	.275	.239	.183	.140	.108	.084	.065	.051	.040	.031	.025	.020
16	.458	.394	.339	.292	.252	.218	.163	.123	.093	.071	.054	.042	.032	.025	.019	.015
17	.436	.371	.317	.270	.231	.198	.146	.108	.080	.060	.045	.034	.026	.020	.015	.012
18	.416	.350	.296	.250	.212	.180	.130	.095	.069	.051	.038	.028	.021	.016	.012	.009
19	.396	.331	.277	.232	.194	.164	.116	.083	.060	.043	.031	.023	.017	.012	.009	.007
20	.377	.312	.258	.215	.178	.149	.104	.073	.051	.037	.026	.019	.014	.010	.007	.005

Fig. 1 Discount Table — to find present value of payment to be made in the future.

Before that time elapsed, your machine probably wouldn't be earning money. To have **any** rate of return, you have to earn back your investment, and then some, within the life of the machine.

Third, let's say you know the annual earnings and you are able to translate these into a true rate of return. You still have to compare this return with other possible returns. What is the risk on this compared to other investments? What if some better machine comes along tomorrow? How about the fact that you can't cash this investment in, like a savings bond, when you need your money? These and other questions need answers before you can get a true picture of the worth of your investment. Some of these answers we've already discussed (Chapt. V) and others will come along in subsequent chapters.

Finding The "Earnings"

Finding the earnings, or cost savings, of a machine investment has been the subject of the first five chapters of this series. The cost savings are in man-hours, direct and indirect, and in any other elements of cost that are reduced by the new machine. The man-hour savings are multiplied by the value of the man-hour (Chapter IV), and added to savings from other sources to get the annual dollar amount.

Changing "Earnings" To "Return"

Now comes the second step. We must find a way to translate these earnings into a figure that will be comparable with other investments. We have to correct for deterioration, obsolescence, life of the machine, taxes, depreciation, and all matters peculiar to machine tools, then be able to answer the simple question, "How much do I make on my money?"

To set the stage for doing this, mathematically, let's recall some facts we learned about interest in grade school.

Problem #1 — As the first fact to recall, let's see what happens when we invest $100 for three years at 10% interest, compounded annually. There are interest tables to use, but we can also work it out longhand.

1st year

$\$100 + (100 \times .10) = \$110.00$

2nd year

$\$110 + (110 \times .10) = \$121.00$

3rd year

$\$121 + (121 \times .10) = \$133.10$

Answer: $100 at 10% interest compounded annually for three years equals $133.10.

This problem could have been stated in other ways. For instance, "If you invest $100 now and receive $133.10 after three years, what is the rate of return?" The answer could be obtained from tables — or worked out longhand — and would be 10%.

Or we could put the question backwards and say, **"At an interest rate of 10%, if you're going to have $133.10 after three years how much**

money must you start with?" Once again, we can work longhand or refer to a table. In this case, the table is called a **discount table.** It is used to find the present value of something we're going to receive in the future, which is exactly what this question asks. Fig. 1 shows a condensed form of this table. To answer this last question we look down the 10% interest column to three years and find the figure .751. Multiply $133.10 by .751 and we get $100.00.

By using this table we can find, for a given interest rate, the amount of money we must have now to obtain a stated amount in the future. This process, called "discounting," is nothing more than solving compound interest problems from future back to present, instead of the more common way, present to future.

For reasons to be explained shortly, this process is the key to finding the rate of return on machine tools.

We state it as follows: **The rate of return on an investment is the interest rate at which the money returned, discounted to the present, equals the investment's cost.**

This is not as complicated as it sounds. Here is what it means in Problem 1. "The rate of return on an investment is the interest rate (10%) at which the money returned ($133.10), discounted to the present (times .751), equals the investment's cost ($100.00)."

For single payments this is pretty easy, but what happens if our money is not returned all at one time? The same statement applies. Let's try it.

Problem #2 — If we buy a $1000 bond with a 5% annual return, take the 5% out in cash each year and sell the bond at the end of the fifth year, what is the return? The answer is 5%, of course, but let's see if we can get this answer by **discounting.**

Cost of the bond is $1000. Here is how the money is returned:

1st year	$50
2nd year	$50
3rd year	$50
4th year	$50
5th year	$1050

Now look at the discount table. Five percent discounted for one year is .952; for two years .907, etc. We can discount to the present the amount of money returned each year as follows:

Column	1	2		3	4
	Year	Money Returned		Discounted at 5%	Discounted Value
	1st	$ 50	times	.952	= $ 47.60
	2nd	50	times	.907	= 45.35
	3rd	50	times	.864	= 43.20
	4th	50	times	.823	= 41.15
	5th	1050	times	.784	= 823.20
		$1250			$1000.50

Again, the rate of return on an investment is the interest rate (5%) at which the money returned (column 2) discounted to the present (column 3) equals the investment's cost (total, column 4).

Column	1	2		3	4
	Year	Money Returned		Discounted at ?	Discounted Value
	1st	$ 250	×	=	
	2nd	250	×	=	
	3rd	250	×	=	
	4th	250	×	=	
	5th	250	×	=	
		$1250			$1000.00

Problem # 3 — In the last example, we received back $1250 over the five years, but most of it in the 5th year. Now, what will the return be if we receive $1250 back at the rate of $250 per year?

Here we have to find what interest rate to put in at the head of column 3 in order to make column 4 add up to $1000. It's a matter of cut and try. First let's try 7%.

Column	1	2		3	4
	Year	Money Returned		Discounted at 7%	Discounted Value
	1st	$ 250	×	.935	= $ 243.75
	2nd	250	×	.873	= 218.25
	3rd	250	×	.816	= 204.00
	4th	250	×	.736	= 190.75
	5th	250	×	.713	= 178.25
		$1250			$1035.00

The $1035 is a little high. We haven't discounted quite enough, so let's try 8%.

The $998.25 is so near to $1000 that we'll call our rate of return on this investment 8%. Once more, the rate of return on this investment is the interest rate (8%) at which the money returned (column 2) discounted to the present (column 3) equals the investment's cost (total of column 4).

Column	1	2		3	4
	Year	Money Returned		Discounted at 8%	Discounted Value
	1st	$ 250	×	.926	= $ 231.50
	2nd	250	×	.857	= 214.25
	3rd	250	×	.794	= 198.50
	4th	250	×	.735	= 183.75
	5th	250	×	.681	= 170.25
		$1250			$ 998.25

This is the mathematical way to measure the rate of return on a machine tool investment. **If we can estimate what money we're going to get back from this investment every year of its service life, including the final year when we trade it in for what we can get for it, we have a mathematical way to find a true rate of return.** We can answer, "What do I make on my money?"

The annual returns may vary all over the lot, but if we can find an interest rate at which to discount these annual returns to make them add up to the original cost, we have our answer.

This may seem to be a long way around to find an answer, but we have to go through this process because we can't just add up all of the expected returns and compare totals. **When** we get the money back is as important as **how much** in finding rate of return. Money has a **time value,** in that the sooner you have it, the sooner you can put it to work earning more money. This method is required to solve for the **time** as well as the amount of the return.

The rate of return in Problem 3 was greater than in Problem 2, even though the total dollar return was the same. We just received more of the return sooner in Problem 3. If we had received the whole $1250 in the first year, our return would have been 25%.

Application Comes Next

There's nothing new in any of this. The discounting process has been used for years in finding the real return from coal mines and other **wasting assets.** It is an essential element in most of the presently used machine tool replacement formulas. I've tried to explain it carefully here because it is the basic principle of the calculation.

Applying this principle to a machine tool investment is the next step. We will do this in the next chapter. ■

Tracer Handles Large Parts

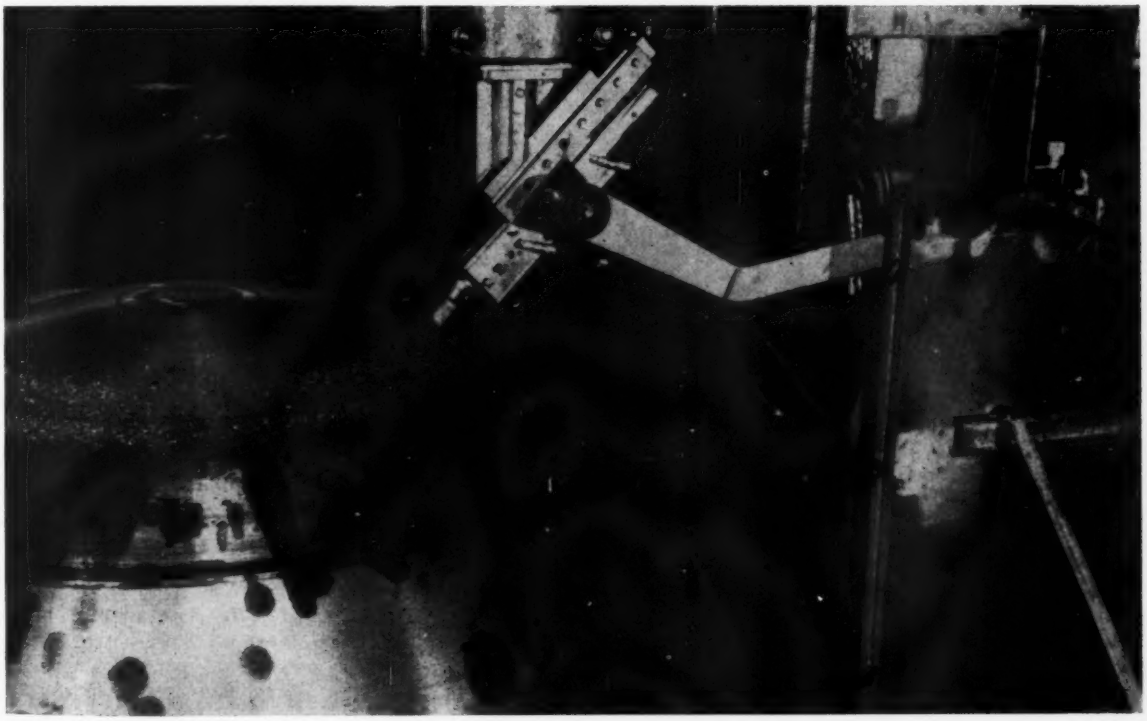
Machining of contoured parts up to 12 ft in dia has been made into a relatively simple operation at the Kinco Inc. plant in Montebello, California.

Handling this work is a Niles Bement Ponds 144″ vertical boring mill with a Mimik 3000 series hydraulic tracer capable of turning all types of spherical radii and irregular contours. The tracer is also used on a 100″ mill in the plant.

This Mimik tracer has a stroke of 8″ and is actuated by a highly sensitive 6 oz pressure stylus and hydraulic valve which follows the template. Any size workpiece can be handled since the stroke is increased indefinitely and continuously by engaging the machine feed, which is set along the mean path of the contour — the tracer absorbing the contour itself. Kinco officials say that they are able to hold exacting tolerances and finishes on large contoured surfaces by this method.

The tracer was made by Allied Pacific Manufacturing Co. of Los Angeles, under license from Mimik Tracers, Inc. of Buffalo, N.Y.

Hydraulic tracer on 144″ vertical boring mill machines 98″ dia spin chuck.



Ceramics Do The Job . . .

When Used Properly

THE FIRST REAL PUBLIC showing of ceramic cutting tools was at the 1955 National Machine Tool Builders' Association exposition. Viewers looked on in amazement as the continuous chip being cut at 1000 fpm arched through the air into a container several feet from the tailstock end of the lathe.

At the 1960 NMTBA show, ceramics were again shown. Steel was being cut at 10,000 fpm or 10 times that of the 1955 performance. Cast iron was being rough turned at 900 fpm, and chilled iron of R_C53 was being production-tracer turned at 470 fpm.

These were spectacular shows—real crowd-pleasers — but many manufacturing men asked, "How can we use it in our shop? What other materials will it machine? Can we rough as well as finish with it? Is this new material just a laboratory development, or is it here to stay? We don't have brand new machines with plenty of power and rigidity like the one being used here."

These questions can be answered by taking a look at what ceramics have done in the past five years to gain acceptance as full-fledged members of the cutting tool family.

Present Uses

Many tool engineers have turned their efforts toward ceramics with outstanding results in increased machining efficiencies. They have pioneered the use of ceramics in areas besides those which seemed best five years ago. Originally used for high speed machining of steel, ceramics are now recognized as the best materials for machining cast iron automotive brake drums. Running three to four times faster than the carbides formerly used, these tools produce twice as many parts between tool changes. They produce better finishes, hold tool life at elevated speeds, and hold better dimensional tolerances. Cycle time is reduced, and production increased accordingly.

Materials being machined with ceramics today include many classes of steel (soft and hard); cast, malleable and chilled irons; graphite; hard carbon alloys; monel metals, and plated nickel. Ceramic tools are proving their effectiveness through their **proper** use. **Proper** is emphasized because the characteristics of this tool material must be understood for it to be applied effectively.

by Benjamin E. Storrs

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Ceramic Characteristics

Ceramics have relatively low transverse rupture strength or shock resistance. Although strengths have been significantly improved in recent months, ceramics are only 50% as strong as the average metal-cutting cemented carbide. This limits feed rates, and the type of cuts that can be taken. The user's previous experience in applying the lower strength carbides will help him in using ceramics, as application practice is similar. Some gain is made by using thicker inserts to overcome breakage, and negative rakes are generally used. In the machining of hardened steel, a high negative rake land at 25-30° has been very effective in eliminating chipping and flaking.

The heat-resistance of the ceramic edge enables it to run at much faster speeds without softening and dulling. Since the insert or tip does not become very hot or conduct heat through to the holder, it is possible to hold every close dimensional tolerances. An example from General Electric's Metal Cutting Laboratory is the turning of 1045 steel at a hardness of 180 Bhn. At a speed of 2000 fpm, size can be held within 0.0003 from one end to the other on a 48″ length of turn.

Materials which do **not** lend

themselves to ceramic use are most plastics, and melomine or fiberglass compounds where abrasive resistance is the chief requirement of the tool material; and where the finishing grades of straight tungsten carbide grades generally excel. The 300 series stainless steels and high temperature alloys (where severe tool wear, even at slow speeds, is a problem with carbides) cannot be successfully machined with ceramics. Wear of ceramics from straight abrasive action is about 10 to 15 times as fast as on the most wear-resistant carbides.

Application Technique

The use of a negative rake tool holder is recommended. If the holder does not have an integral clamp and chipbreaker, a chipbreaker plate should be used to spread the clamping pressure over a larger area. Square, triangular and round inserts are available, and tips are available for special applications where epoxy resins must be used to cement the tip to the shank because of extreme difficulty in brazing this material.

Hand-honing of the insert is recommended, since it prevents chipping, and inserts are available in the honed condition, ready for use. The only exception is in the machining of hardened steels, where a sharp edge cuts much better than a honed edge. Here the high negative rake land gives added edge strength, but the edge is still straight and sharp.

Machines

The big question in many minds is: Can I use present equipment or will new equipment be an absolute requirement for ceramic use?

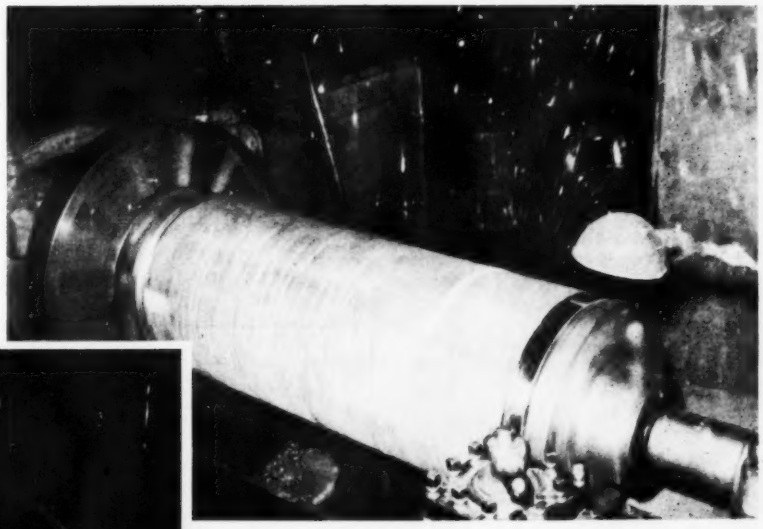
The answer is not obvious, but is one of economics tied directly to the kinds of parts machined, that portion of machining which has good ceramic-use potential, mechanical condition of present equipment, and the speed ranges available. In many cases, the ceramic tool is used for a finishing operation immediately after roughing cuts. In other cases, ceramic use is a separate operation. These factors influence the decision as to whether enough savings can be made to justify the cost of using new or special equipment.

Machines in poor condition are generally unsuitable, especially if vibration and chatter are present. This is very detrimental to tool life, and most trials with ceramics may be very unrewarding under these conditions.

Most applications have been made on equipment available in the user's shop. Many successful operations are being run on machines more than 5 or 10 yrs old. If you are considering new turning or boring equipment, however, it would be well to determine whether your parts can be machined with ceramics, and if so, let the machine tool builder supply a machine with the necessary requirements.

One important requirement is that chip guards or deflectors be used when there is danger of flying chips. Such chips are a safety hazard, especially those produced while machining cast iron or meehanite at high speeds. The harder the iron, the more pronounced will be the tendency for chips to fly.

Now for a look at a few of the many jobs that are running or have been run with ceramics.



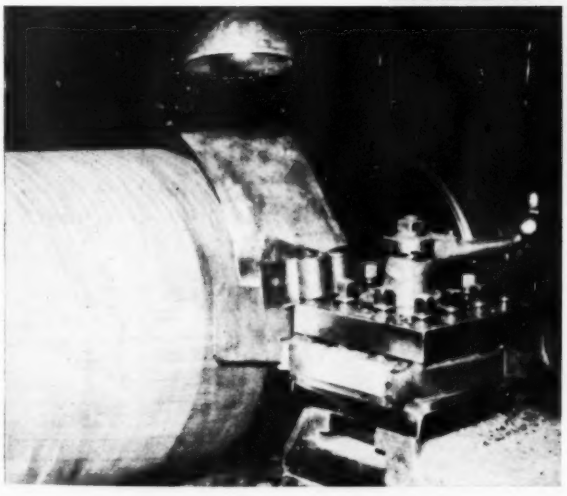


Fig. 1 Cast iron cylinder liner is turned with ceramics in one-third of the time required with carbide. Flying chips are controlled by chip guard shown in use in photo to the left.

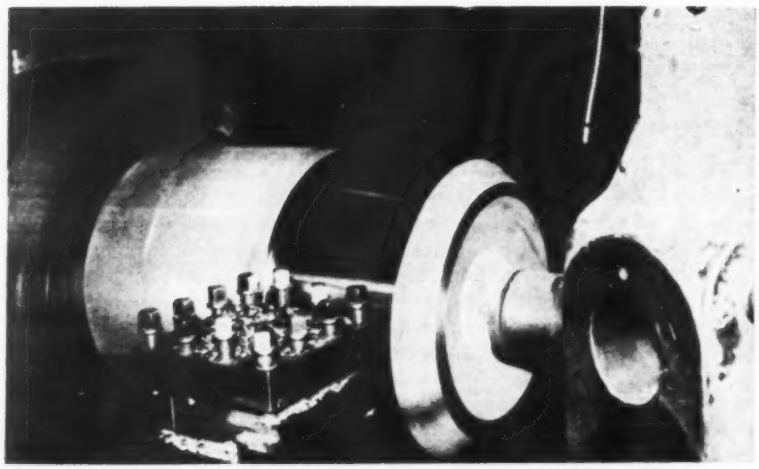


Fig. 2 Standard machines are used to turn this cast iron piston at 800 fpm. Cutting time with ceramic tools is 7 min and production has doubled.

Case History No. 1

On a job at Cooper Bessemer Corp., Mt. Vernon, Ohio, ceramics have saved time and increased production (Fig. 1).

CENTRIFUGALLY CAST CYLINDER LINER

Material – cast iron, Spec. MSC-3, 210 Brinell.
Size (as cast) – 18" ID, 18⅞" OD and 46½" long.
Operation – turn for grind in one cut to 18.535" dia.
Machine – LeBlond 30" heavy duty lathe.
Insert – Carboloy cemented oxide, grade 0-30, SQT-245P5 (¾" sq., 5/16" thick) 1/64" wide with 28° negative rake land along each edge and radii.
Holder – Ceroc C304R.
Speed – 195 rpm, or 950 fpm.
Feed – 0.016 ipr or 3.12 ipm.
Depth of cut – 3/16" to 5/16", depending on runout of part.
Cutting time – 15 min.
Tool life – two pcs/index or 30 min.

The floor to floor time is now *1 hr*, including the additional grooving, etc. performed with carbide tools. The exit end as well as the entrance end are chamfered prior to turning with the ceramic tool to eliminate or reduce breakage and chipping. The previous method was to take two passes to turn the OD with carbide, and floor to floor time was *3 hrs*. Ceramics decreased the time by ⅔, and tripled the production capacity of this machine.

Case History No. 2

Another job at the company shows similar savings (Fig. 2).

The use of ceramics on this job increased production 100%, and as a result a second lathe with its accompanying labor and overhead rate has been freed completely for other work. The cut is interrupted by casting defects and

PISTON

Material – cast iron, sand cast.
Size (as cast) – 14½" OD, 12-3/16" ID, 20-5/16" long.
Operation – semi-finish turn a length of 18-9/16" to 14-1/8" dia.
Machine – Warner & Swasey #4A turret lathe.
Insert – Carboloy cemented oxide, grade 0-30 SQT-245P5 as in the cylinder liner job.
Holder – Ceroc C304R.
Speed – 212 rpm or 800 fpm.
Feed – 0.0124 ipr or 2.628 ipm.
Depth of cut – 3/16" to 5/16" depending on runout of part.
Cutting time – 7 min.
Tool life – 8 pcs or 56 min of cutting time.

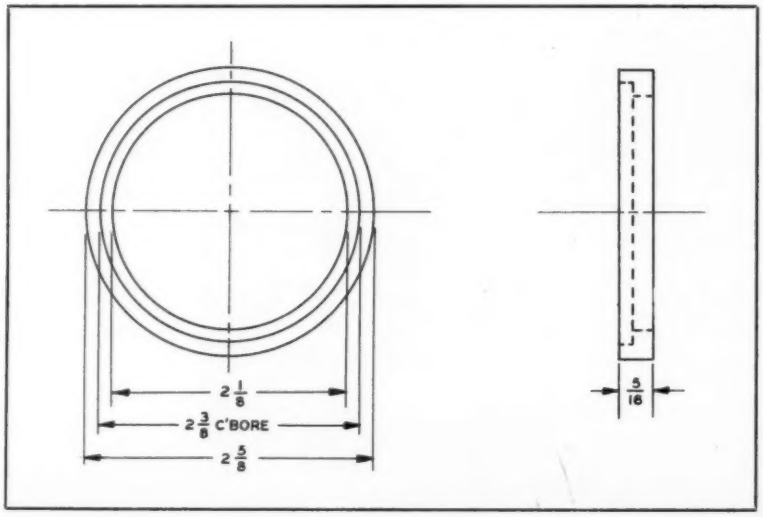


Fig. 3 Low tool life with carbides on this hard carbon ring caused a switch to ceramics. Nominal sizes are shown, but actual sizes require very close tolerances.

sand holes in the castings, but the ceramic performs without breakage.

Case History No. 3

Here is an example showing the ability of ceramics to machine chilled iron at speeds much higher than that of carbides. This job is done periodically at the Cleveland Automatic Machine Co., Cincinnati, Ohio.

MIDDLE AND REAR ROLLS

Material — chilled cast iron, R_C50-60.
Operation — turn for grind 5.020/5.023" dia x 10¼" long in one cut.
Machine — Warner & Swasey #2A turret lathe.
Insert — SQT-163P4, grade 0-30.
Holder — Carboloy SBTR-85.
Speed — 132 fpm.
Feed — 0.008 ipr.
Depth of cut — 0.035".
Cutting time — 12.8 min.

With carbide, turning time was 40 min. Ceramics resulted in a savings of 27.2 min/pc. and produced a good finish with negligible taper of the part.

Case History No. 4

Another application at a different company is of particular interest because of the kind of part and tooling.

The user produces various styles of carbon parts similar to the one shown in Fig. 3, varying in hardness from soft to more than R_C65. The extremely low tool life with carbide tools on the harder grades of carbon hindered production of many parts. Plant supervisors began a thorough program to determine the advantage of ceramics. The job was done successfully as the data in Table 1 indicates.

TABLE 1

In the following application data, work materials are listed only as A, B, C, etc. Hardness increases from A to J, the latter being more than R_C65.

Material	Speed (fpm)	Pcs/Edge: Finishing grade of Carbide	Pcs/Edge: Carboloy Cemented Oxide 0-30
A	1700	72	16
B	975	518	73
C	950	96	191
D	950	50	86
E	1450	20	65
F	1850	8	52
G	1400	5	40
H	700	6	200
I	900	10	303
J	Not Known	1/3	9

The personnel had never used ceramics before. It was necessary for them to learn how to cement tips to shanks, and then grind them. Both operations were done very successfully. Surprisingly enough, as far as the ceramic is concerned, no negative rakes were used and corner radii were zero to 0.005" (Fig. 4), both conditions generally accepted as detrimental to tool life. After grinding, tools are placed on foam rubber protectors in plastic containers for protection of the tool points.

Tests were run on the normal production machines — 6" to 8" Hardinge lathes with hand feeds. During the testing procedure, an interesting wear phenomenon was observed. Tool life was better with the straight tungsten carbide grades on materials up to R_C25, but was much better with ceramic grade 0-30 as the hardness increased from that point.

Conclusion

Ceramic tools have proven their worth as a very good complement to — not a replacement for — the other cutting tool materials. Every opportunity should be taken to apply them to your operations on a thorough basis, using a tool engineer or application man who can follow each job and make changes necessary to insure satisfactory performance. ■

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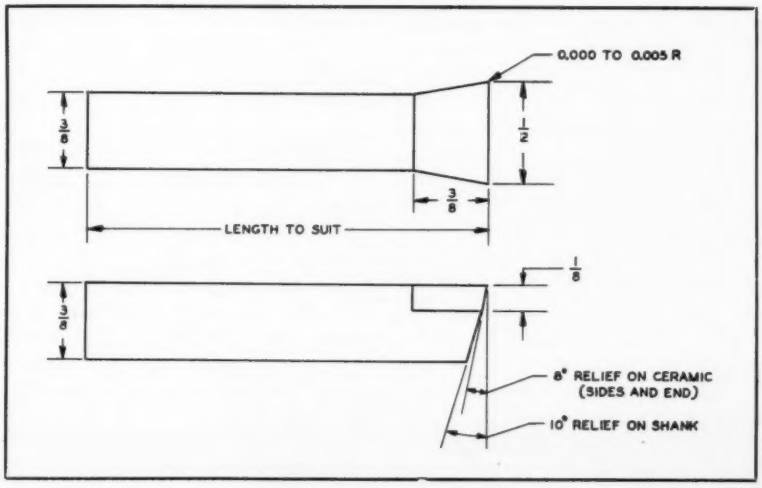
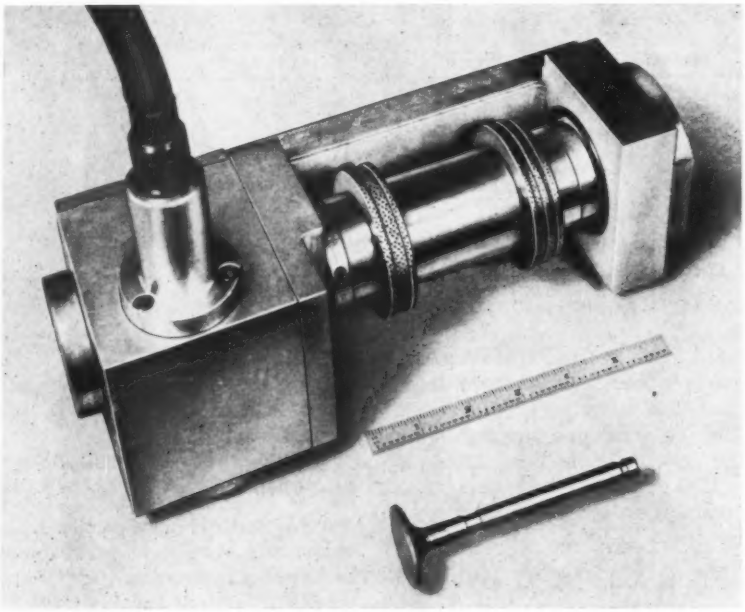


Fig. 4 Ceramic tool for machining carbon rings has sharp corner radii and no negative rakes. This geometry is ordinarily detrimental to tool life, but was effective here.

New Rotary Dresser Saves Grinding $$$$



This composite unit simultaneously dresses two grinding wheels mounted on a single spindle.

Grinding is the most important operation in the Northville, Mich., valve plant of Ford Motor Co., and consistency of parts reproduction at a staggering pace is essential.

To improve quality and accurate parts repeatability, engineers there have converted grinding wheel dressing from single point diamond methods to Tru-Grit rotary diamond set form dressing wheels.

Quality control records kept since the conversion show that, in addition to better parts uniformity, it has allowed longer grinding wheel life, reduced diamond dressing tool costs and savings in labor costs.

The rotary tool dresses the entire face of the grinding wheel in a single plunge, between the ejection of one part and feeding of the next, eliminating the variance that previously occurred while the single-point diamond tool traversed the face of the wheel during the grinding of the part.

The first machine converted was a #12½ Landis centerless grinder, using a Norton 24 x 0.625″ x 18″ wheel to grind the keeper groove and chamfer on the foot of an intake valve stem. The Tru-Grit method has allowed the average production to be raised from 32,000 to more than 136,000 parts/wheel.

Diamond dressing tool cost per part has dropped more than 40% and may go even lower. The cost analysis was based on 1,000,000 parts/tool, but production passed that figure with the original Tru-Grit rotary tool still in service.

Greater wheel and tool life have reduced the setup and maintenance time to a quarter of that needed before conversion. In addition to the direct labor-cost saving, returning this former downtime to production has a favorable effect on per-part cost reduction.

In the same plant, conversion of a #2 Cincinnati centerless grinder almost doubled production while raising quality and improving parts uniformity.

In its original design, using the single point diamond dressing method, the contour of the Falcon exhaust valve made necessary two separate dressing and grinding operations to grind two spaced grooves and a chamfer on the foot. An average of 6 single point diamond tools and 2 hrs of tool change or setup time were needed each day.

To combine the two operations on a single machine, the spindle was modified to accommodate two grinding wheels, and the electrical and hydraulic circuitry were altered to accept the new form dressing tools. A composite Tru-Grit unit was designed to dress both grinding wheels simultaneously.

The single machine now grinds two grooves and the chamfer at the same time, with dressing accomplished in 2½ sec "between parts"; this compared to the full minute required previously, during grinding, with the resultant scrap loss due to variance.

Original cost of the Tru-Grit equipment is many times that of the single point type, but since the first unit has never worn out, no complete cost analysis is possible. The unit was returned to the factory only to re-form one portion when the retainer groove was redesigned. For more information about Tru-Grit dressing units, write to Wheel Trueing Tool Co., Detroit, Mich., or circle Inform-A-Gram No. D2.

Welded Tubing Comes of Age

DOM electricweld tubing begins with a sheet mill product rather than a tube round. Both inside and outside welding flash is removed to close tolerances during manufacture, and heat treatment assures homogeneity of the weld area itself, causing it to "disappear," for good granular uniformity.

Boiler tubes, condenser and heat exchanger tubes are all said to be like candidates for this new material.

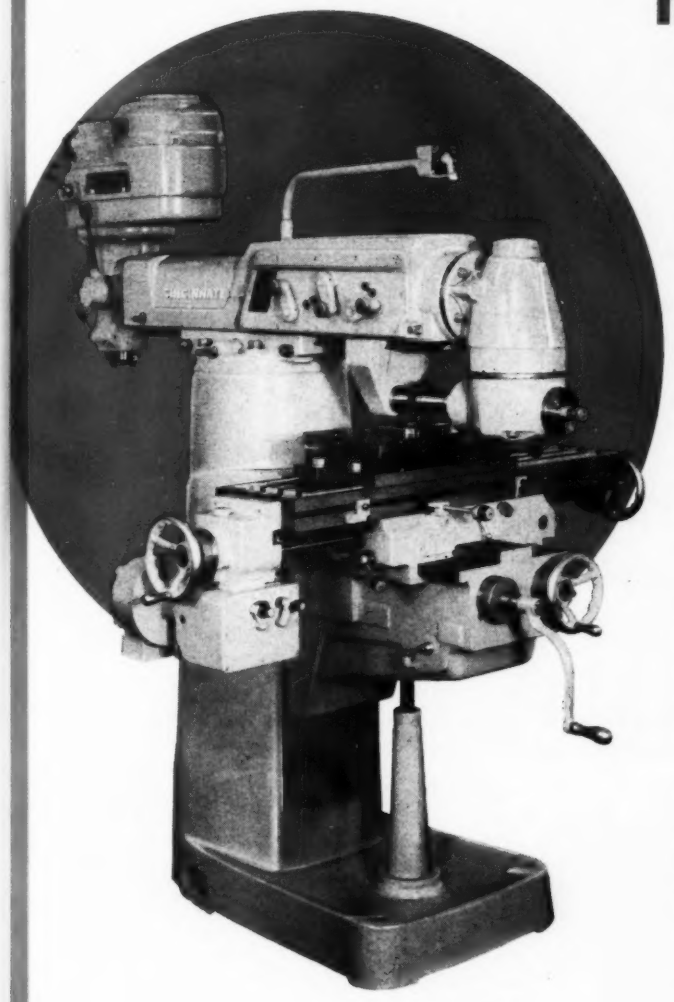
Lower cost, cold-finished, drawn-over-mandrel electric resistance weld tubing may take over many markets traditionally held by cold-finished seamless tubing. Direct material cost savings of 5 to 45% can be obtained using the new tubing, says H. N. Scott of the electricweld tube division, Jones & Laughlin Steel Corp.

CINCINNATI

CINCINNATI MILLING MACHINE DIVISION

Announces New

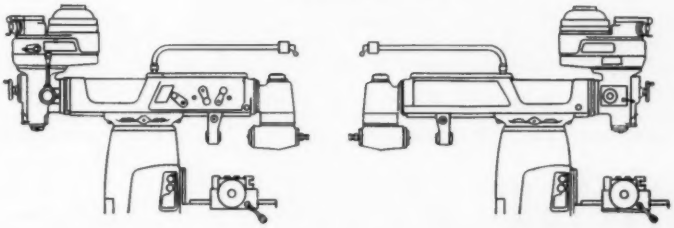
H-V TOOLMASTER
MILLING MACHINE



How's this for a new idea in light-duty toolroom milling . . . a turret type machine for both horizontal and vertical operations! The new CINCINNATI H-V Toolmaster gives you this unique degree of versatility. In the illustration, the H-V is performing a horizontal milling operation with the double swivel spindle head. The arbor and arbor support can be removed, and the same spindle head is ready for vertical or angular milling operations. Or to save setup time, the machine may be equipped with any one of three vertical spindle heads on the opposite end of the overarm. Then the double swivel head becomes a permanent horizontal setup, with 2 hp drive. Merely swiveling the overarm turret 180° locates the vertical spindle over the table for vertical and angular milling, drilling and boring.

H-V Toolmaster versatility is unmatched by any other machine in its class. Vital statistics for the spindle head include: 2 hp gear drive . . . eight spindle speeds, 75 to 1130 rpm or 50 to 750 rpm . . . No. 40 standard spindle nose . . . arbor support for arbors up to 1¼" diameter.

More information on the H-V and on the entire line of Toolmasters will be found in publications M-2229 and M-2110. Write or telephone today for your copies. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio,** *REdwood 1-2121.*



Horizontal or vertical milling head is available within a minute or two, by merely swiveling the overarm turret of this H-V Toolmaster Milling Machine equipped with a No. 1D Vertical Head. Drawings at right illustrate its unique range of versatility.

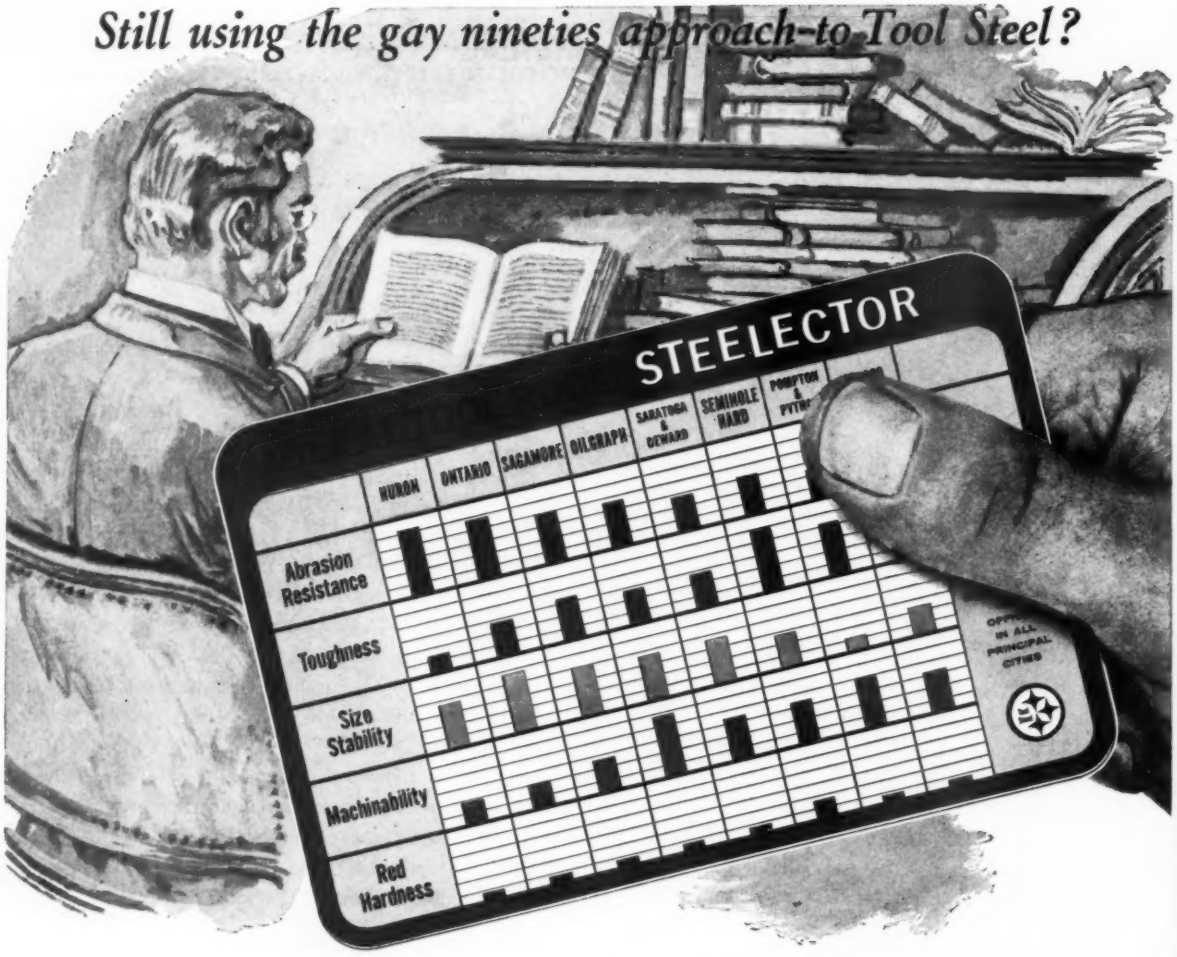
CINCINNATI®

MILLING MACHINE DIVISION

TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES • CUTTER AND GRINDERS • VERTICAL BROACHING MACHINES • ELECTRICAL MACHINING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 35

Still using the gay nineties approach-to-Tool Steel?



Use the New, Modern A-L Steelector System

Now you can accurately select the proper tool steel based on its individual characteristics and be sure that it's available for off-the-shelf delivery before you place your order.

The new Allegheny Ludlum STEELECTOR Program makes tool steel selection fast. And it eliminates the embarrassment of specifying a grade which later turns out to be unavailable or available only after a costly delay.

The leading grades of tool steel that meet 96 percent of all applications—as listed in the Allegheny Ludlum Tool Steel Handbook—form the basis of the STEELECTOR Program. The STEELECTOR Grades are charted on cards covering each group of steels (tool room, hot work, and high speed grades) to help you select the particular grade best for your application.

Bar graphs on each STEELECTOR Card show how the various grades compare in abrasion resistance, toughness, size stability, machinability and red hardness. It's easy to determine accurately the combination of properties that best suits the job at hand.

The complete necessary range of sizes and shapes is listed in a special Data Stock List for every grade. These lists also include heat treating, typical working hardnesses and other data to insure that your selection is correct.

You can choose with confidence because every STEELECTOR grade has been selected from the complete line of Allegheny Ludlum Tool Steel and made under the rigid quality control standards of all A-L products.

For a complete explanation of the STEELECTOR Program, ask your Allegheny Ludlum sales representative for a copy of the colorful A-L Tool Steel STEELECTOR Booklet, or write: *Allegheny Ludlum Steel Corp., Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. TP-7-1*

STEELECTOR PROGRAM

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CIRCLE INFORM-A-GRAM KEY NO. 36

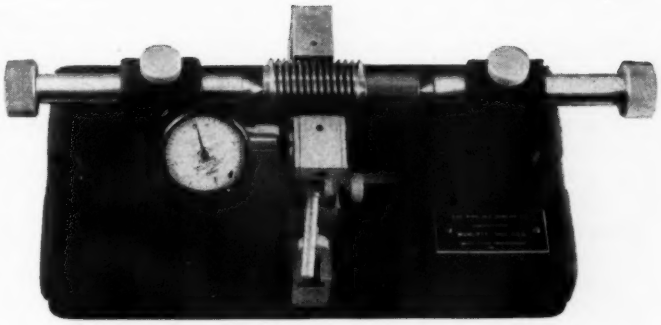
GAGES GET A FAST TRIAL AND FAIR SENTENCE...

with Pipe Machinery's Drunken Thread Checker

Easy to set up, easy to operate, Pipe Machinery's amazing new Drunken Thread Checker tries gages for helix deviation, or drunken thread, and passes sentence all in a matter of seconds! The finding it makes — a direct reading of the degree the helix deviates from normal — is final and incontestable.

A diameter over wire check of gages provides insufficient evidence to enable you to render an "acceptable" verdict. In order to be a fair judge in your gage inspection, a check for drunken thread, in addition to a careful examination of, among other things, lead, angles and pitch diameter is always required.

The instrument shown is easily adapted to product inspection with male or female centers.



For more complete information write us on your company letterhead today.

THE PIPE MACHINERY COMPANY
29100 Lakeland Boulevard • Wickliffe, Ohio • Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 37

From the cover:

Accuracy Assured With New Tool Presetting Machine

"WE ARE ABLE to make settings to 0.0001 on radius and length," says a DeVlieg Machine Co. vice president in describing his firm's new precision tool presetting machine. (Total resolution of the setting is between 0.00015 and 0.0002.) H. A. Beyer says that the unit should provide the vital degree of accuracy for presetting tools to close bore diameters and length, quickly and with ease.

The machine consists of a precision presetting spindle, mounted on a cast iron base, and is equipped with transverse and longitudinal slide adjustments. It will accommodate tools with all types of shanks up to 8″ dia and 18″ maximum length from gage line in the taper socket. Suitable adapters for a variety of tapers and toolholders can be provided.

The presetting spindle has a combination #50NMTB/#50 flash-change taper, and the spindle is mounted in precision ball bushings, arranged with ball thrust plate and equipped with hand wheel for manual rotation. The base is close-grained cast iron, properly ribbed for maximum rigidity. Top of the base is a precision scraped surface plate that provides proper mounting for the spindle. It has adequate working area for auxiliary setting equipment — a little gage "island" for out on the floor.

The two coordinate positioning slide elements consist of a saddle mounted on dovetail and flatways, with longitudinal movement parallel to the spindle axis, and a transverse slide member that moves on cylindrical guide ways normal to the spindle axis.

Slide elements are equipped with Vernac direct reading optical measuring instruments that can read directly to 0.0001 without interpolation. The Vernac instrument mounted on the transverse slide provides control of radial (diameter) settings, while the Vernac on the longitudinal slide controls length or depth settings.

Coarse and fine handwheel control are provided for the movement of both slides. A Bausch & Lomb 40 power illuminated macroscope with special crosshair reticule is mounted on the slides for optical sighting of the tool point.

Tools preset with the new machine allow users to take advantage of the optimum accuracy of numerically controlled machine tools, say DeVlieg officials. But they're quick to point out that conventional systems can also profit by using the machine.

Complete details on the unit are available from DeVlieg Machine Co., Fair St., Royal Oak, Mich., or circle Inform-A-Gram No. D3.

Panning for Gold?

Thar's gold in thet thar rinse water, and Technic, Inc., intends to salvage it.

The Providence, R.I. firm, which makes gold, platinum, rhodium and palladium plating solutions, has developed the Gold Saver. It's billed as the first commercial unit for regaining gold which was formerly lost by electroplaters.

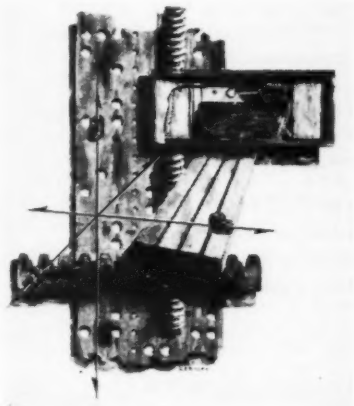
Technic says that between 4% and 10% of all gold used in electroplating has heretofore been lost during final rinsing of the plated objects. The heart of their recovery system is a column of special resin which traps the gold before rinsing. A pump is also part of the unit.

Practice has been to conserve the original gold solution by dipping the plated item into a tank of water immediately after plating. This solution eventually develops a re-usable gold concentration. Next step has been a rinse in running water, resulting in the loss of the unbonded portion of diluted gold solution.

The Gold Saver is to precede the running water rinse. The unit is installed in a tank containing water. The pump constantly circulates the tank's water and diluted gold solution through the special, gold-recovering resin. Gold may be reclaimed from the saturated resin by the plater, a refiner, or by Technic.

More on "Which Door To Tape Control?"

—a closer look at Retrofitting



TOOLING & PRODUCTION'S special report, "Which Door To Tape Control?", (Jan. '61) was presented in the hope that it would churn up opinions and ease actions in this period of transition to numerical control. One of the responses it has elicited comes from a man who for the past several years has been studying the economic feasibility of retrofitting numerical controls to machine tools. Peter D. Tilton, industrial research engineer at Stanford Research Institute, authored a comprehensive report on the subject in 1957, referred to in the January article. He is now conducting a study of retrofitted machines for the Bureau of Naval Weapons. Mr. Tilton's letter follows:

"Congratulations on your very fine article "Which Door To Tape Control" in the January 1961 issue of Tooling & Production. You have given an excellent presentation of the difficult and controversial subject of retrofit. Although many of the fine points concerning individual types of machine tools and control systems could not be treated in detail, the most essential points were covered both comprehensively and fairly.

"Two of the points you covered, however, warrant some further comment, perhaps, based on information only recently developed. The following observations have been made in connection with the current Navy (Bureau of Naval Weapons) program to evaluate four different retrofitted machine tool and control system combinations.

"**Machine Condition Important.** The basic machine condition does not seem to be as significant a factor as you indicate. Machine condition is critical only in retrofit applications where extensive modification is not required. This applies to the addition of two-axis positioning tables and other conversions which use certain portions of the basic machine intact. In all cases . . . the spindle drive mechanism should be in good condition.

"On the other hand, most retrofit conversions of continuous-path machines require changing the machine axis drives, in which case the original condition of the machine makes little difference. The change-over from Acme screws to ball-nut screws, the substitution of precision power gearing, or the addition of hydraulic cylinders, as is usually done, requires almost complete teardown of the machine anyway, and much of the original machine would be replaced even if in first class condition. In most instances of this sort, there is ample opportunity to renovate the ways, true up the machine, and correct certain conditions of wear with relatively little additional effort. Often, too, different tolerances are necessary for some basic adjustments when numerical control is added, such that even new machines may require some rework. Thus, there is much less advantage to having a machine in good condition when extensive modification is involved.

"These same considerations also apply to the life expectancy of retrofitted machines. Machines converted by simple bolt-on packages have essentially the same outlook regarding wear and life as they did before. When the retrofit machine is rebuilt from the ground up, though — as is usually done in most continuous-path applications — the outlook approaches that of a new machine. With complete rebuilding for retrofit, machine elements can be restored to peak condition, parts replaced, and new auxiliary systems added. In the case of the four Navy machines now being retrofitted, ways, gearing, bearings, hydraulics, electrical wiring, and other essential parts have been replaced with new material. In some machines even spindle motors have been replaced, and

the spindles rebuilt as necessary to equal (or better) the original machine condition. The anticipated life and rate of deterioration of these machines are therefore expected to be substantially the same as for comparable new machines.

"Buy Now, Add N-C Later. Although there are a few types of machines which can be purchased with conventional manual controls for later conversion to numerical control, this possibility is not quite as prevalent or realistic as your article tends to imply. Again, much depends on the particular application, machine, and control system. Simple bolt-on positioning table systems, for instance, can easily be added to drill presses and similar machines at some later date. Obviously, there is little advantage to buying the necessary mechanical table first and the electronic controls later when this type of system is considered.

"At the other extreme, machines engineered for continuous-path servo drives are not always conveniently adapted for manual control. Often, too, this involves an appreciable added cost for manual control equipment which must be scrapped when N-C is added.

"The principal argument against the piece-meal approach is economic — interim operation using manual methods merely defers the benefits of numerical control and wastes the opportunity to achieve them sooner. A machine designed and engineered for numerical control but operated conventionally offers relatively little production advantage over conventional manual machines, but would cost considerably more. If the full cost of numerical controls is ever justifiable for a particular machine on the basis of anticipated workload, then it will generally be justifiable at the outset in terms of the better accuracy, increased production, and cost savings which are possible. Thus, the buy-now, add-N-C later plan appears to be a poor bargain in most cases.

"Tracer-equipped machines may be noteworthy exceptions in some cases. In the first place, they already employ servo drives which may be directly convertible for numerical control. In some circumstances, there may be immediate machine applications in production runs using existing tooling for tracer methods, and also an opportunity to adopt NC methods in future runs. When this is the case, a suitable choice of machine tool and control system could facilitate later conversion to numerical control in an economic fashion." ■

Peter D. Tilton
Industrial Research Engineer
Stanford Research Institute
South Pasadena, California

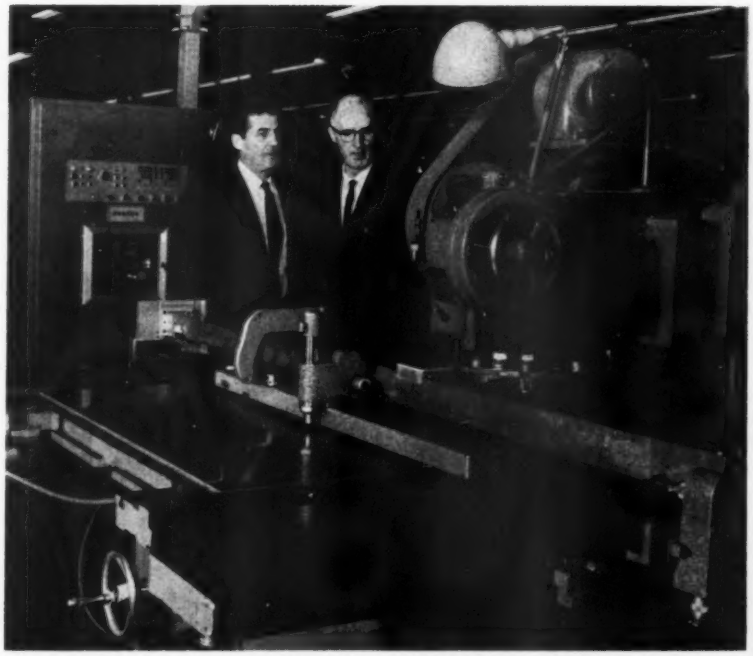
Punch Press Converted to NC

Reports on a retrofitting job performed at Hughes Aircraft Co.'s industrial systems division for its own ground systems group at Fullerton, Calif. tell a success story. Operating costs are reduced at least 50%. Production lead time is cut from one week to one day. And accuracy is boosted from ±0.010 to ±0.004 linear tolerance.

The company fitted a two-axis Hughes NC-200 numerical control unit to a Wiedemann RA 41P turret punch press. This is believed to be the first successful adaptation of a standard numerical control system to a punch press. It's the same two- and three-axis control system that comes as original equipment with five different machine tool lines.

The special adaptation required for the punch press application was the addition of electrically driven lead screws to the table, and binary cams on the turret stations for turret position control.

All machine instructions are punched into tape by Hughes manufacturing services division's planning department. The transistorized control unit reads tape data, positions the work and actuates the punch.



Donald F. Davern (right) manager of Hughes industrial control systems, inspects the tape-controlled punch press with Robert C. Robbins, head manufacturing services division for Hughes' ground systems group, Fullerton, Calif. The installation is in use at the division.

Templates are eliminated, meaning that their storage is no longer a problem, and neither are the engineering changes associated with templates. For additional information circle Inform-A-Gram No. D4.

A STOCK LEMPCO DIE SET HELPED H. K. METALCRAFT DO THE "IMPOSSIBLE"!

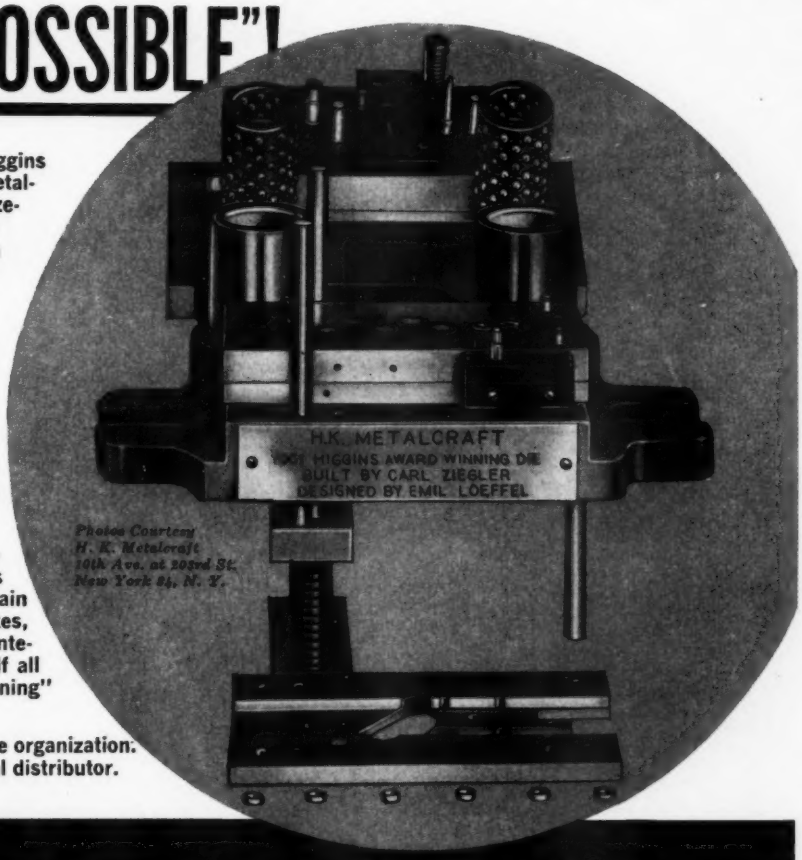
Winner of the John Woodman Higgins Award for 1961, Emil Loeffel, Metalcraft tool engineer, mounted his prize-winning dies in STOCK Lempco Die Sets, assembled to his order by a N. Y. City Lempco Distributor; see photos.

These dies produce, at $1.75 per thousand, a part which formerly cost $12 per thousand.

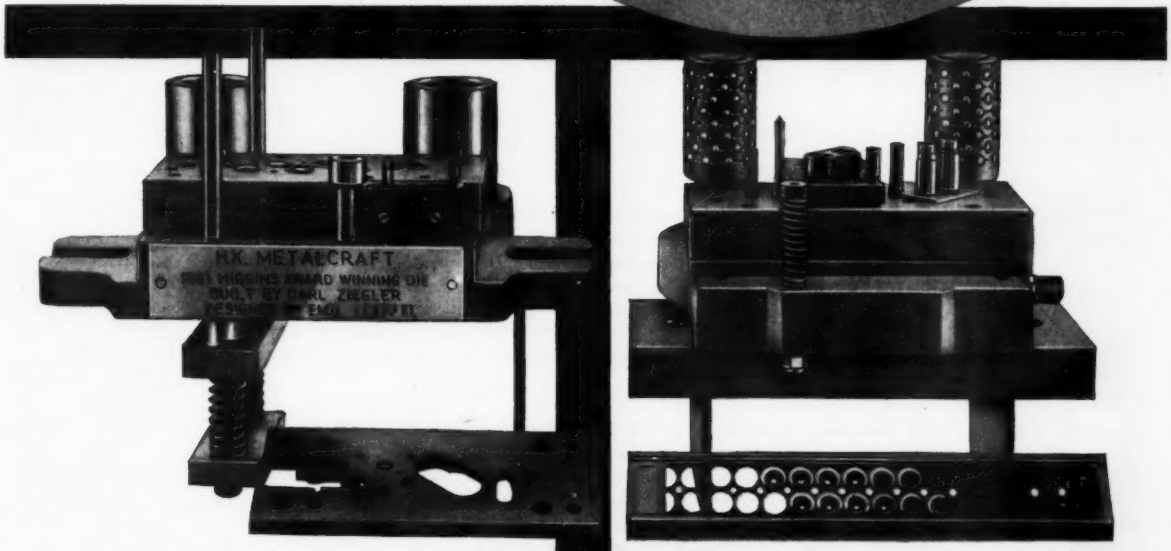
It was no accident that Lempco Die Sets were selected; Mr. Loeffel says he trusts their accuracy completely and adds, " . . . time saved in assembly and disassembly is very considerable".

Lempco Ball Bearing Precision Die Sets have long been known for this feature and for their ability to maintain exact alignment for millions of strokes, with an absolute minimum of maintenance. Why not find out for yourself all the advantages of using "prize-winning" die sets?

Lempco has a nation-wide warehouse organization. Write for literature and name of local distributor.



Photos Courtesy H. K. Metalcraft 10th Ave. at 205rd St. New York 34, N. Y.



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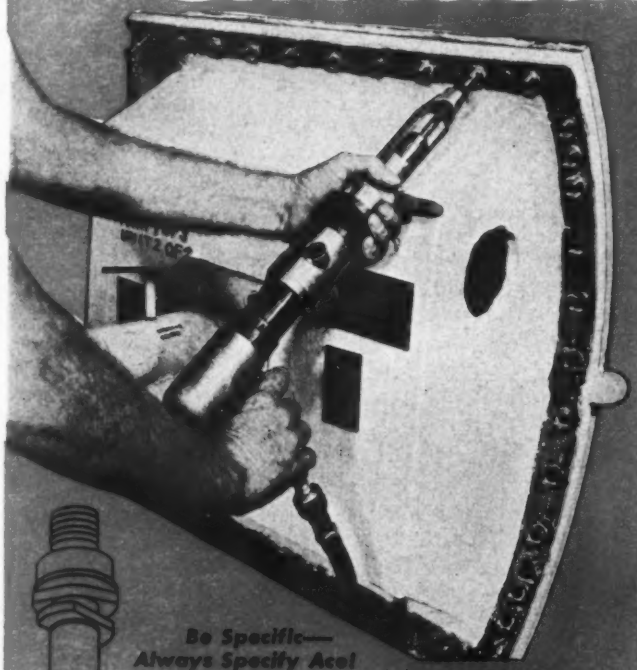
OF MECHANICAL AIR-FEED DRILLS — BACK SPOT FACERS AND TAPPERS

on Plastics... or Metals



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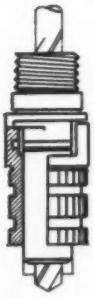
ACE-KELLER

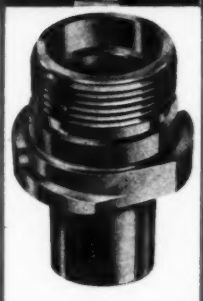
***ACE-KELLER DRILL BUSHING TIPS**

made from 52-100 long-wear bearing steel, provide a fast, accurate method for portable or stationary mounting of drilling, tapping and other self-contained machining units on a jig or fixture. The threaded end of the drill bushing tip screws into the nose end of the drilling unit. Locking flanges on the tip fit under the shoulders of lock screws or lock strips on the jig, effectively holding the drilling unit in alignment position and absorbing both the thrust and torque of drilling.



***ACE ADAPTER TIPS AND LOCK LINERS**

ACE Precision Adapter Tips and Lock Liner Bushings are designed for fiberglass and plastic tooling requiring the use of automatic feed drill motors. The ACE adapter tip fits all standard automatic feed drill motors such as Keller, Aro, Buckeye, Quackenbush, etc. A close tolerance is maintained when drilling rivet holes in stainless steel, titanium, nickel and other hard or exotic metals.



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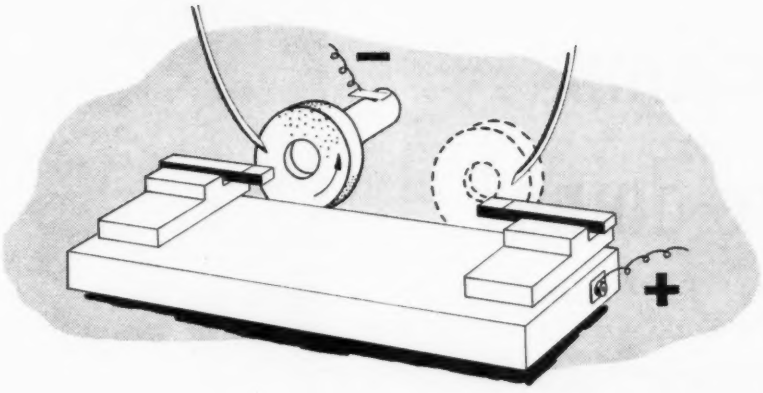
CIRCLE INFORM-A-GRAM KEY NO. 42

Electrolytic Grinding



Contributes To Customer Savings

RAY NOVKOV came back from the 1955 Machine Tool Exposition convinced that electrolytic grinding could help him save money. Shortly thereafter he installed a Hammond oscillating grinder equipped with an Anocut 300 amp power pack, and he hasn't raised the prices on his carbide cutoff and grooving tools since.

Mr. Novkov is president of Manchester Machine & Tool Co., Akron, Ohio. The firm supplies the brazed tools and Manchester's own patented toolholders to such users as General Electric, Pratt & Whitney, and Curtiss-Wright.

Shortly after switching to electrolytic grinding, Novkov compared its costs with those of the conventional methods he had been using. He found he was saving about $40 a day with the electrolytic method, reflected chiefly in longer diamond wheel life. Bolstered by this comparison, Novkov bought a second electrolytic unit — a 150 amp Anocut model — now in use on a Hammond chipbreaker grinder.

This second model is used for "roughing" cuts on two faces of the carbide insert for Manchester grooving tools. The operator of this unit says she regularly removes about 0.015 from each face of the insert in one short pass across the wheel.

This tool is finished to within its commercial tolerance of 0.002 in about 2 min of hand-fed grinding on another machine. This latter operation regularly takes off about 0.006 of carbide, where the electrolytic roughing cut removes about 0.015 in one pass that takes approximately 3 sec. Though the electrolytic method delivers a smooth finish, this secondary operation is dictated by the ultra-smoothness desired by the aircraft parts manufacturers using the tool.

Novkov has equipped the 300 amp model with an automatic air feed he developed to speed and control the grinding of both faces of the carbide cutoff tool done on the machine. The operator merely loads each of the two fixtures with the insert to be ground, initiates the feed, and unloads the fixtures after a 20 to 30 sec operation. This cut takes off from 0.010 to 0.012, and there's no further grinding necessary.

They buy about three metal bond diamond wheels a year for this oscillating grinder. Novkov says the wheels cost about $400 each. They formerly ground these inserts conventionally at a diamond cost of 18 to 20 cents/tool. They can hardly measure the cost per tool now, but they know it's less than a penny. The diamond particles merely wipe away the carbide "debris" that's de-plated from the tool in the electrolytic method.

The adoption of electrolytic grinding is the fruit of retooling, which has been undertaken five times in the 11 yr life of Manchester Machine & Tool Co. Novkov and Bill Stein, his consulting engineer, are continually looking for methods that will enable them to produce tools more economically. They try to pass their savings on to their customers, and the pace of activity in their shop indicates that they're competing pretty well.

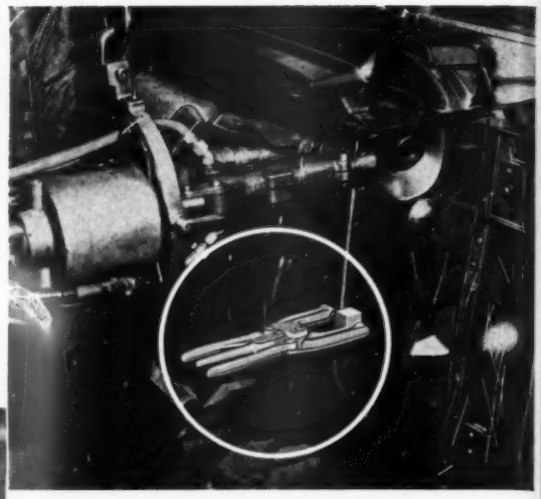
They run both electrolytic grinders most of an 8 hr shift, and Novkov reports that maintenance costs on the units have been negligible since installation.

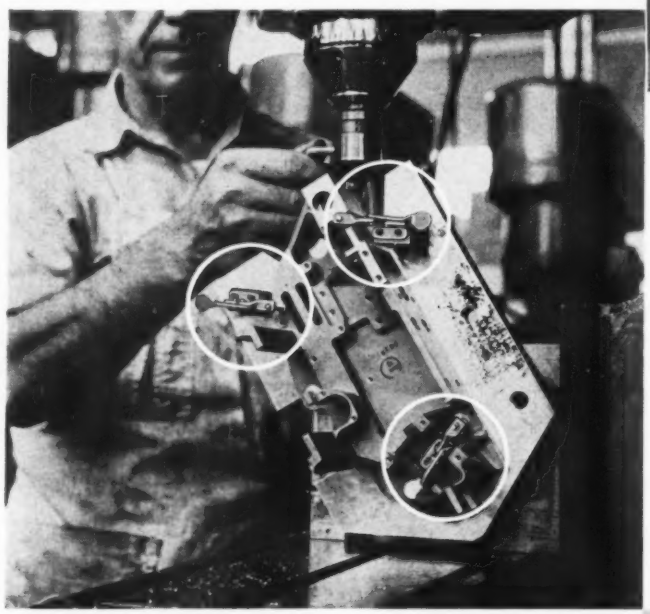
How many working days have passed at Manchester since the switch to electroyltic grinding? That figure multiplied by $40 adds up to eye-opening savings since Novkov and Stein attended that Exposition. ■

No. 2 of a series

Look what clamps are doing!

Practical uses of Wespo Toggle Clamps and Pliers that may suggest ways you can save

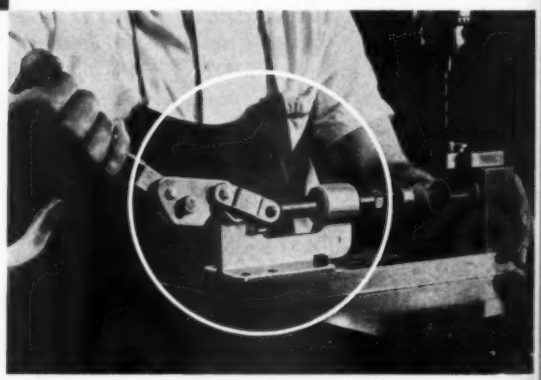




Low Cost Wespo Toggle Pliers have a myriad of uses in assembling operations—as portable clamps, clamping where space is limited, or overhead clamping. Their usefulness as portable clamps is demonstrated in this auto body welding operation. The plier shown has the Wespo "Quick-Trigger" release which permits one hand operation. All Wespo toggle pliers are engineered for fast, positive locking with a minimum amount of hand pressure. They are available in numerous styles and jaw sizes.

This Wespo Push-Pull Clamp serves as a simple fixture to hold a knurled ring securely during the drilling operation. The adjustable spindle is fitted with a large pad which mates with the inside diameter of the ring, holding it securely. Wespo makes a variety of push-pull clamps for use where smooth, horizontal clamping action is required. All models feature the "better 3-ways" Wespo design and are ruggedly built to stand hard use. Some models have locking action in both the "push" and "pull" positions.

Miniature Toggle Clamps, only 2½" overall!—These small, light weight Wespo Series 50 Clamps can do a hundred different jobs on small fixtures such as the one shown above. Their compact design and smooth operation also make them useful in the assembly of small parts, in electronic wiring and soldering operations, on fixtures where space is limited... anywhere a small, rugged clamp is needed. Maximum holding pressure is 35 lbs. Available with a horizontal or vertical mounting base; adjustable spindle.



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CIRCLE INFORM-A-GRAM KEY NO. 44

special report from Fair Street on cutting tool geometry

ONE OF A SERIES

what relief angle is... how it greatly affects tool life

CHART SHOWING RELATION OF RELIEF TO TOOL LIFE*

Side or Lead Relief	Pieces per Run	% of Tool Life
2°	53	29%
3°	78	43%
4°	104	57%
5°	124	68%
6°	146	80%
7°	165	90%
8°	182	100%
9°	139	76%
10°	95	52%
11°	65	36%
12°	43	23%

(Tools removed when wear land was 3/64" contour of cutting edge; feeds-speeds and all other variables were held constant.)

*BY PERMISSION FROM DESIGN AND USE OF CUTTING TOOLS, BY LEO J. ST. CLAIR. COPYRIGHT, 1952. MCGRAW-HILL BOOK COMPANY, INC.

MICROPOINT TOOL GRINDER PROVIDES ABSOLUTE CONTROL OF RELIEF

The purpose of any machining operation is to produce a chip; a good chip, hence leaving the part as the by-product of the machining process. To operate any machine tool, the cutting edge of the cutting tool being used in the machine tool spindle, must be ground with a certain angle of relief. This angle, or clearance, makes it possible to freely feed the tool into the workpiece, and allows the tool to cut without interference.

WHAT CORRECT RELIEF ANGLE IS

The correct relief angle for any given cut is the smallest possible angle that can be used without creating interference between the cutting tool and the part piece. The correct relief angle will provide the tool point maximum support without interference. Too much relief will cause visible or microscopic chipping of the cutting tool edge. Too little relief will create rubbing, hence undue heat and pressure.

The chart at the right, based on a series of tests in actual machining operations, dramatically illustrates the importance of the correct relief angle for maximum tool life. As shown, a variation of only one or two degrees can reduce tool life as much as 34% to 48%.

HOW TO ESTABLISH CORRECT RELIEF

The correct angle of relief varies according to the nature of the machining operation as well as the size and shape of the cutting tool. Establishment of the correct relief angle for any given cut is a test process. Final selection is best determined by actual test cutting experience, as well as consideration of previous cutting experience. Once established, however, the angle should remain constant for a given set of circumstances.

HOW MICROPOINT REPEATS CORRECT RELIEF ONCE IT HAS BEEN ESTABLISHED

Once the correct tool geometry, in this case relief angle, has been established, it is extremely important that proper grinding equipment be available to maintain this relief angle and geometry for duplicate grinds. The DeVlieg MICROPOINT Tool Grinder was specifically designed for this purpose. In fact it is the only grinder in its field able to repeat a given geometry to the very finest limits of accuracy.

MICROPOINT CONTROLS ALL FACTORS

MICROPOINT not only quickly and accurately reproduces the correct relief angle but controls all other factors in single point tool geometry as well. Direct dial settings provide a method of fast, simple, accurate adjustment for each radius, cutting edge angle, offset and relief in exact accordance with the geometric requirements of the tool point in a full range of sizes and shapes.

For further information about the DeVlieg MICROPOINT Tool Grinder, please write or visit DeVlieg Machine Company, Fair Street, Royal Oak, Michigan.

DeVlieg
MICROPOINT® TOOL GRINDER
for grinding all sizes and types of round and square shanked tools

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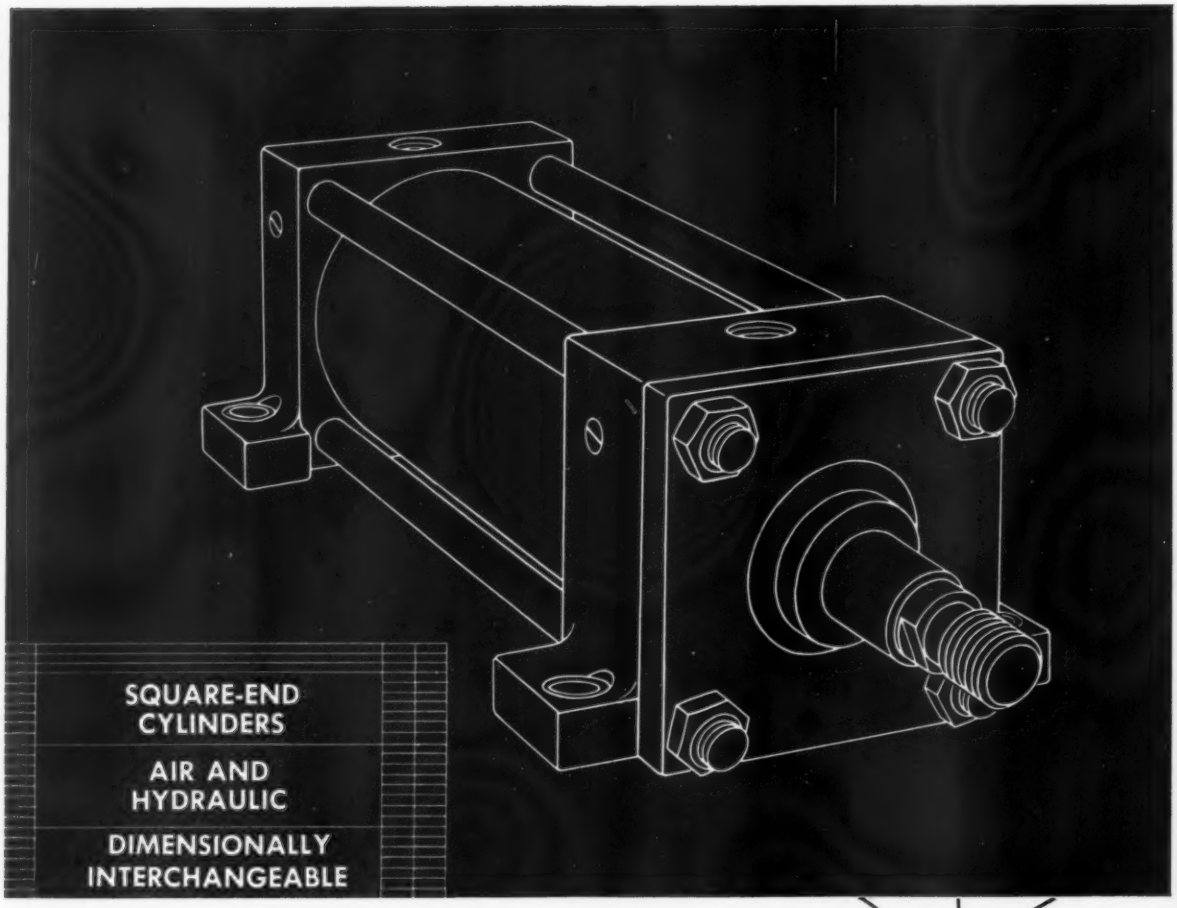
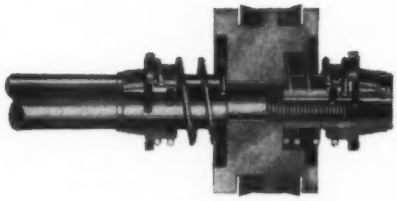


How MEAD takes the BUMP out of high-speed pistons



FULL FLOATING CUSHIONS

Detail shows two-stage feature of full floating cushion on a piston used for hydraulic pressures over 250 psi. MEAD Square-End Cylinders also offer these other design advantages:

- Seamless, hard drawn, micro-finish brass barrel for long piston seal life
- Cold drawn steel cylinder heads with all surfaces permeated with black oxide for rust resistance
- High tensile chrome plated steel piston rods
- Accurately machined rod bearing cartridge made of solid bearing bronze

Special *full floating cushions* in new MEAD Square-End Cylinders are uniquely mounted on springs rather than on solid studs. The result is a smooth, high-speed piston advance without the use of ball checks. In hydraulic units, the two-stage design of the floating cushions completely eliminates bumping. Fully adjustable from the slightest measurable cushioning effect to complete stoppage, the full floating feature also reduces cushion wear caused by impurities in the working medium. In air models up to 250 PSI and hydraulic units up to 1000 PSI, MEAD Square-End Cylinders are available in a full range of bore, stroke and piston sizes. Complete selection of mounting styles. All units are dimensionally interchangeable and conform to JIC specifications. For consultation and information on quick delivery and competitive prices, write to MEAD *today.*

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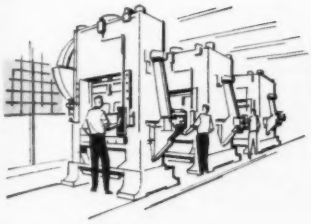

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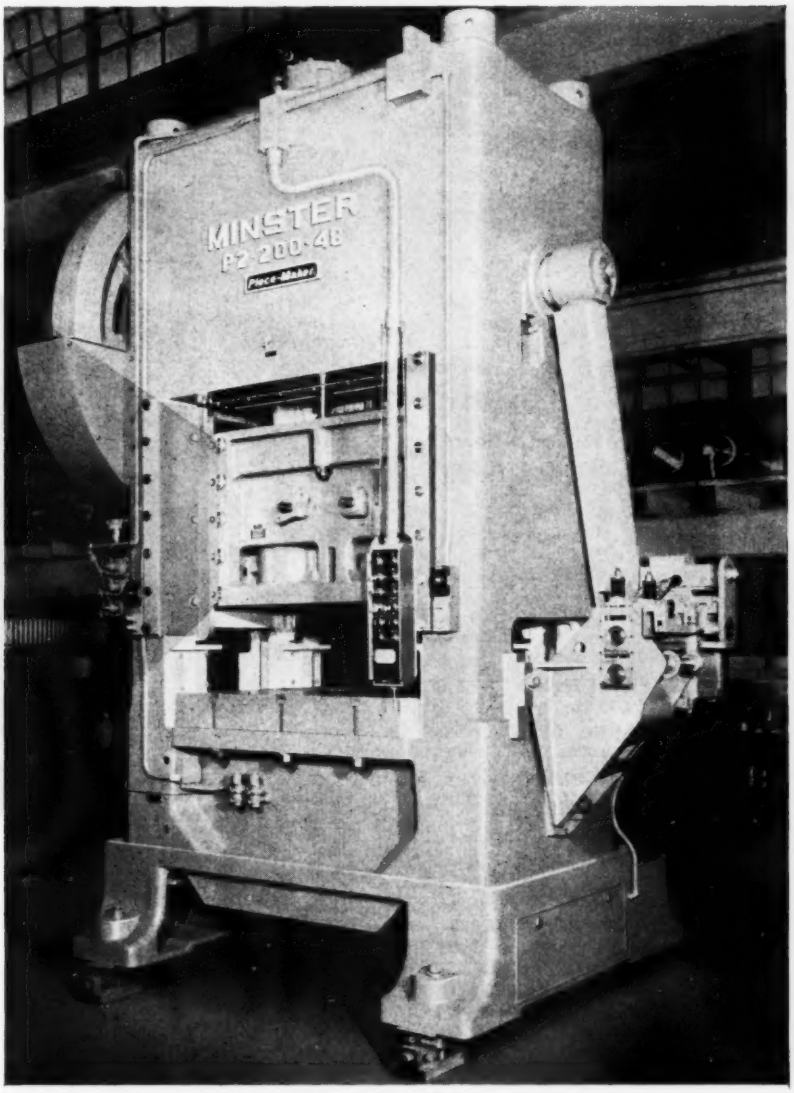

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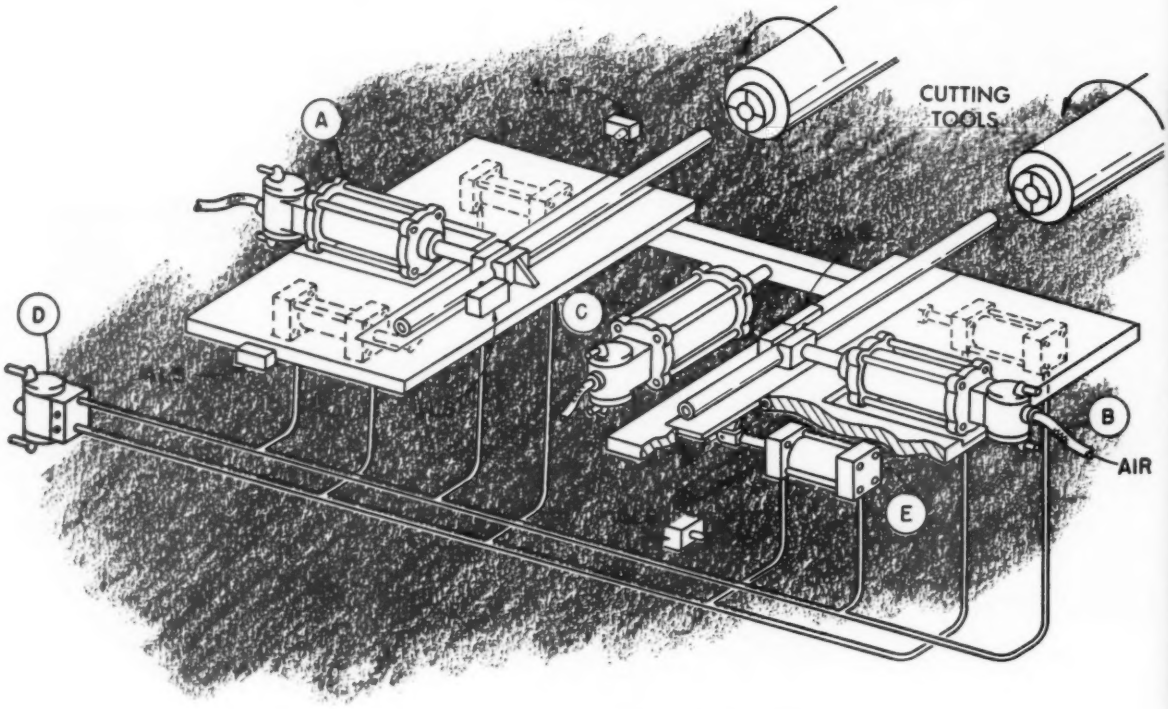

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C3	C9	C15	C21	C27	C33	D3	P5	P11	P17	P23	P29	
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Moore Jig Borer area at Fibreform Electronics; checking fixtures and inspection tools in the foreground.

"We feel strongly that our seven Moore Jig Borers are the heart of our business today." —*says Fred H. Sperbeck, partner, Fibreform Electronics, Inc., Los Angeles*

"The trend towards closer tolerances, small quantities, and quick deliveries on precision-machined parts for the electronics and missile industries has created a most difficult problem for companies manufacturing these parts.

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"At Fibreform Electronics, we feel strongly that the seven Moore Jig Borers we have purchased since 1956 are the heart of our business today, and will continue to be in the future."

For locating and boring holes in dies, jigs and production parts, the speed and accuracy of the Moore Jig Borer has never been equalled. You can easily split "tenths" with the new Moore No. 3 Jig Borer.

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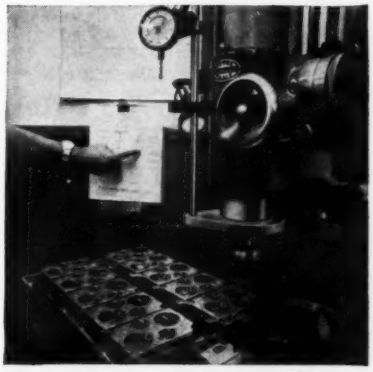

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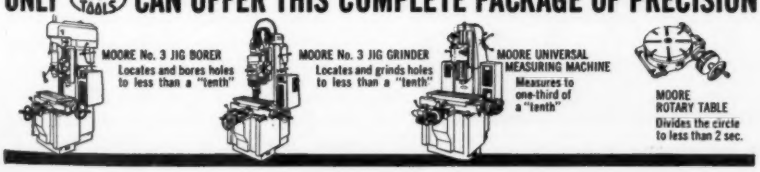
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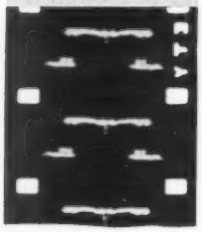
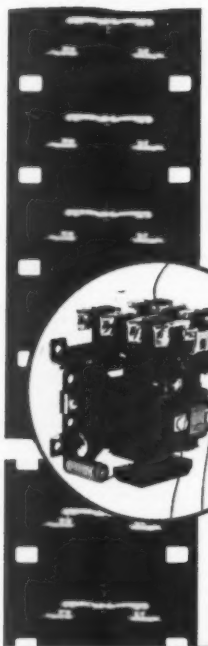
"Tool Steel Trends," a new publication from the committee of Tool Steel Producers, American Iron and Steel Institute will appear every 3 to 4 months. It is offered to Tooling & Production readers free on Inform-A-Gram No. C2.

Actual reproductions from FASTAX high-speed films, taken at 7,500 frames per-second, used to analyze contact operation.





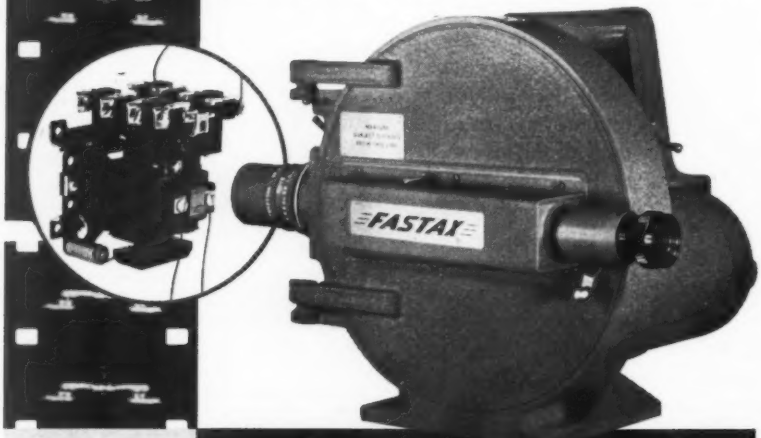
How Allen-Bradley uses *FASTAX* to check super-speed components

Allen-Bradley engineers had to *know* how contacts in their motor control relays stood up under stress, when operating too fast for the human eye to follow.

Using a FASTAX high speed motion picture camera, they *photographed* contact action and got a permanent, accurate record at a film speed of 7500 frames per second.

Later, when projected at slow speeds, Allen-Bradley engineers could examine the structural behavior of relay components—contacts, plungers and springs. Motion studies like this have helped develop better relays for A-B customers.

For all around research and industrial use, the FASTAX is the most versatile motion analysis tool available. With framing rates up to 18,000 pps and effective shutter speeds up to 1/800,000 of a second high speed subjects of every variety can be observed in slow motion.



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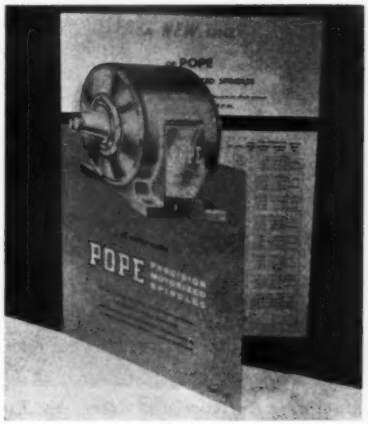
CIRCLE INFORM-A-GRAM KEY NO. 52

"If you Can't Measure it—You Can't Make it" is the provocative title of Bulletin 8009 issued by Moore-Products Co. Circle Inform-A-Gram No. C3.

Tube-O-Matic presents an entirely new approach to valve design. It was originated by Airmatic Valves, Inc. to solve problems of valve wear and maintenance in controlling abrasive or corrosive fluids and gases. Inform-A-Gram No. C4.



High precision motorized spindles with a vibration amplitude of twenty-five millionths, and maximum shaft runout of only seventy-five millionths, are extolled in Brochure S-23 from Pope Machinery Corp. Inform-A-Gram No. C5.

Optidress grinds wheels optically and mounts permanently to practically any standard surface or tool and cutter grinding machine. The unit is described in a brochure from Parker-Hartford Corp. Inform-A-Gram No. C6.

NEW TRU-GRIT® ROTARY DIAMOND DRESSING TRAVERSE WHEEL controls finish, ends tool-change downtime loss, develops taper-free grinding face, holds accuracy, cuts production costs.

The new Tru-Grit Rotary Traverse Dressing Wheel is a straight-faced, power-driven wheel with hundreds of high-quality, small, selected diamonds hand-set in an overlapping cutting pattern.

Ideal for use on straight-faced grinding wheels, it presents to the grinding face, not one single diamond point, but hundreds of small, sharp, fast-cutting diamond points which generate uniform fracture of the grinding face and consequent uniformity of finish on the workpiece, impractical by other methods.

This dress, performed in a single, swift pass at regular intervals with minimum infeed, imposes negligible wear on dressing wheel and grinding wheel, yet keeps the grinding face uniformly sharp and free-cutting.

Thus, since there is virtually no change in the cutting face of the wheel from one grind to the next, workpiece finish is maintained at controlled uniformity.

Grinding face need never become loaded or dulled to the point where finish falls below specification. Specified finish can be maintained with minimum operator attention. Where desirable, the entire application can be automated.

Available finishes are within the 30-55 rms range. Taper-free straight surface is developed within .0002″ and geometrical roundness of workpiece diameter within .0002″.

There is no recurrent downtime for tool set-up. A typical Tru-Grit Rotary, Power Driven Traverse Wheel set-up on a grinder using a 24″ x $3\frac{5}{16}$″, 60-grain wheel, developing an oil-retaining finish within 30-55 rms, remained in original setting until replaced with a new one after it had performed 10,930 dressings and the wheel had produced 1,366,512 pieces. Obviously, savings were substantial.

The Tru-Grit Diamond Dressing Traverse Wheel may hold equally important cost-cutting potential for you. We invite you to write us about possible applications.

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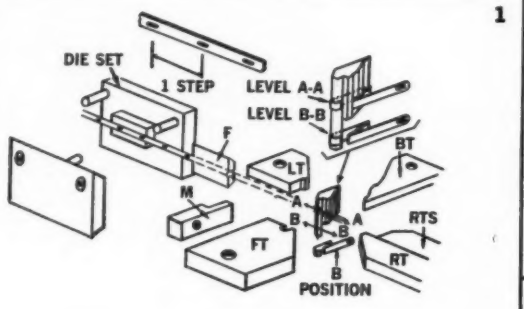
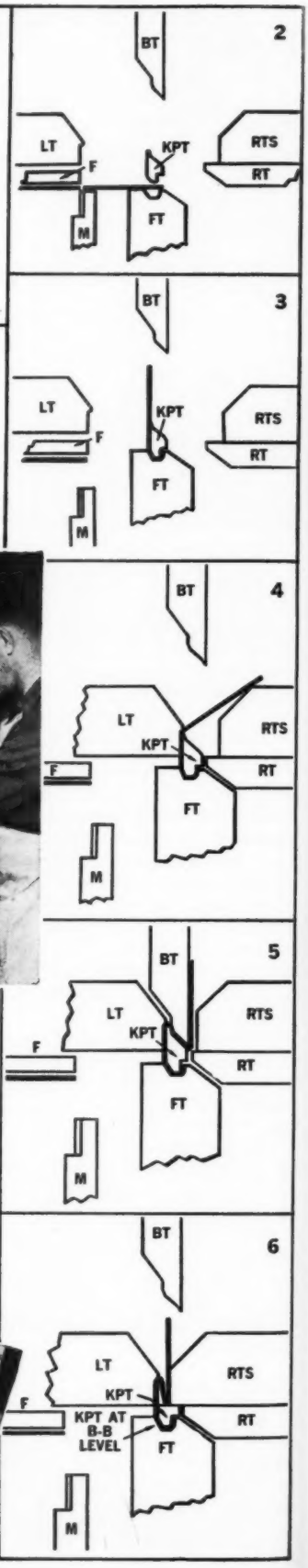
CIRCLE INFORM-A-GRAM KEY NO. 53

KEY:

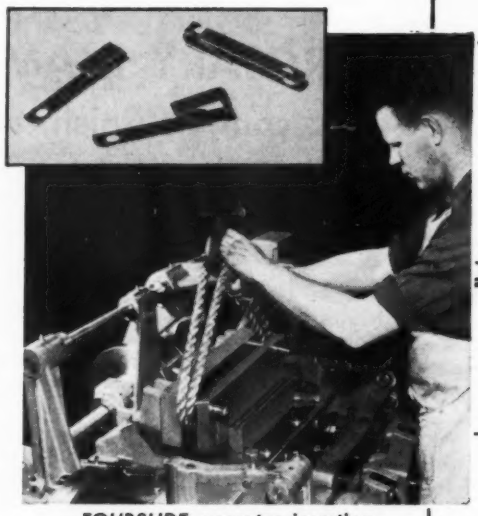
FT	Front Tool
LT	Left Tool
BT	Back Tool
RT	Right Tool
RTS	Right Tool Secondary
KPT	King Post Tool
F	Female Cut-off
M	Male Cut-off





ELIMINATE SECONDARY OPERATIONS WITH THE NILSON FOURSLIDE

By combining stamping and forming in one FOURSLIDE Machine, miniature, precision electronic spring temper parts are produced at high rates.



FOURSLIDE operator inserting a die set in a built-in press.

A 5/8" long Contact Spring of phosphor bronze, 2 Nos. hard (spring temper), is produced on a NILSON Model S-O-F FOURSLIDE at speeds of 350/minute. Tolerances are held to ±0.0005" when required. The piercing of the hole in the Contact Spring is done in the Built-in Press of the NILSON S-F Model or in a Model 00 using a standard Horizontal Press Attachment.

The oblong hole in the Contact Spring is pierced in the Die Set (Figure 1). Then ribbon metal is fed into the forming area, where it is formed around the King Post Tool in plane A-A by the side tools (Figures 2-5). In Figure 6, the King Post Tool has been raised to the B-B level, so the Right Tool Secondary can final close the double bend. This 5/8" Contact Spring must compress to .032" and spring back to .050", with the sides parallel within .010 T.I.R.

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CIRCLE INFORM-A-GRAM KEY NO. 54

Catalogs . . .

Machine mounts that isolate shock and noise and dampen 85% or more of machine vibration are illustrated in Bulletin 4131 from Clark-Cutler-McDermott Co. For your free copy circle Inform-A-Gram No. C7.

Automatic multiple operation machining is discussed in a folder from The Globe Tapping Machine Co. Inform-A-Gram No. C8.

Circling Inform-A-Gram No. C9 will bring you Folder 2975 from Link Belt Co. It describes type MC geared flexible motor couplings, a new low cost geared coupling for electric motor applications.

Inform-A-Gram No. C10 will bring you Bulletin 91051 describing Airmatic Valve Inc.'s complete line of valves, cylinders, accessories, pumps and special controls.

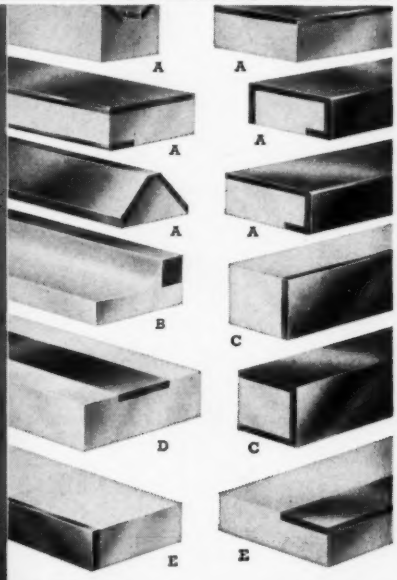
Changing any conventional grinder to an electrolytic grinding unit will be simple with Hi-Cut power converters from Hi-Carb Corp. Circle Inform-A-Gram No. C11 and read how Hi-Cut cuts grinding costs up to 83% on your own equipment.

Selection of grinding wheels is simplified with a new "Cut-Off Wheels" bulletin from Dayton Safety Grinding Wheel Div., Simonds Worden White Co. Inform-A-Gram No. C12.

Saf-T-Bloc, an adjustable safety positioner is credited with reductions in accidents and power press downtime. The Duff-Norton Co. unit is described in Bulletin AD-108. Inform-A-Gram No. C13.

Brinell hardness testing machines, penetrascopes, ductility testers, tensile, compression and hydrostatic testing machines, and transverse testers are all discussed in a brochure from Steel City Testing Machines, Inc. Inform-A-Gram No. C14.

A—Hardened Ways and Slides
B—Composite Die Sections
C—Heel Block
D—Center Clad
E—Flange Slide



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CIRCLE INFORM-A-GRAM KEY NO. 55

Catalogs . . .

Precision stock removal at production rates is the subject of Bulletin S-161 from Speedlap Corp. Inform-A-Gram No. C15.

A catalog supplement from Hale Fire Pump Co. deals with Series 3A, 4A and 9A piston-type accumulators and available accessories. Circle Inform-A-Gram No. C16.

Sine V was designed to reduce setup time and insure accuracy for angular milling, grinding and boring of round stock. Production Tool & Die Co. describes the sine in a bulletin. Inform-A-Gram No. C17.

Design highlights, specifications and attachments for universal ram type turret lathe #3, from Warner & Swasey Co., are covered in a free brochure. Circle Inform-A-Gram No. C18.

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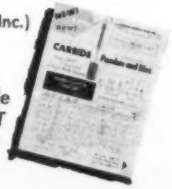

CIRCLE INFORM-A-GRAM KEY NO. 56

"Takeups with Sleeve, Ball or Roller Bearings," is the title of Book 2741 offered by Link-Belt Co. Circle Inform-A-Gram No. C19.

Information on application of welding positioners for increased profits and comprehensive specifications on 1000 to 24,000 lbs capacity models is given in Section 8 of "Positioneering." For this free literature from Aronson Machine Co., circle Inform-A-Gram No. C20.

Heavy duty lathes ranging from 17½ to 25" swing over the beds, are outlined in Bulletin HD-1016 from R. K. LeBlond Machine Tool Co. Inform-A-Gram No. C21.

Spanseal, uni-directional shut-off valves with an integral actuator are covered in Bulletin 5000 from Ledeen, Inc. Inform-A-Gram No. C22.

"Heat Process Engineering" is the title of Catalog 100 issued by Gas Appliance Service, Inc. Chapters on gas burners, gas heating units, flame heat treating, silver soldering, brazing and annealing are of interest. Circle Inform-A-Gram No. C23.

"Barrett Centrifugal Galvanizers" is a brochure from The Leon J. Barrett Co. The galvanizers are powered by direct electric motor, permit rapid acceleration and virtually snap off excess metal. Production speeds range from 4000 to 7800 lbs/hr. Inform-A-Gram No. C24.

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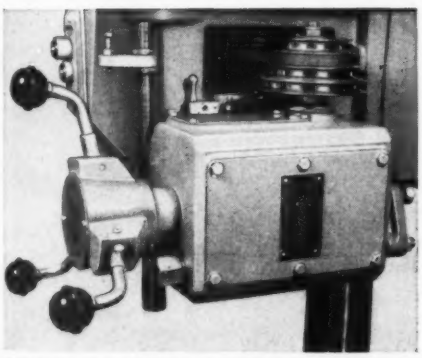

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CIRCLE INFORM-A-GRAM KEY NO. 57

Catalogs . . .

"Basic Training for the Multiple Spindle Automatic Bar Machine Operator," is the title of a series of articles reprinted from Automatic Machining for Greenlee Bros. & Co. Covered are elements of machine construction, collets and cams, setup preliminaries, tool setting, recessing and reaming, trouble-shooting and what to do about chatter. Inform-A-Gram No. C25.

Table type horizontal boring mills Series F are featured in literature from The Cincinnati Gilbert Machine Tool Co. Specifications, two types of pendant controls, automatic positioning, tracer controls, numerical controls and accessories are detailed. Inform-A-Gram No. C26.

"Questions and Answers about Valving" is the title of a 42-page booklet offered by Ingersoll-Rand Co. Mark Inform-A-Gram No. C27.

Pure atmosphere in continuous brazing, annealing, and sintering operations is maintained with straight-through mesh belt furnaces from Harper Electric Furnace Corp. For Bulletin MB-960 mark Inform-A-Gram No. C28.

A new coolant, free from salt-depositing characteristics, is recommended for machining and grinding of ferrous metals. It's especially suited for use where cleanliness and rust prevention are more important than high lubrication. Baker/Gubbins Co. offers a descriptive flyer. Inform-A-Gram No. C29.

Air gages, models 120 and 240 are outlined in Catalog 61 from Standard Gage Co., Inc. Check Inform-A-Gram No. C30.

Speed-torque curves, duty specifications, dimensions and a wide range of ratings are listed in a bulletin on torque motors from The Ohio Electric Mfg. Co., subsidiary Howell Electric Motors Co. Inform-A-Gram No. C31.

"Design ABC's of Rolled Worm Threads" lauds the virtues of worm production by thread rolling vs. cutting, grinding and hobbing. For this free booklet from Landis Machine Co., mark Inform-A-Gram No. C32.

The spindle that actually floats on 0.0001 film of air is illustrated in the new Air-Flo Brochure published by Harig Mfg. Corp. Inform-A-Gram No. C33.

"Splinedicator," a composite indicator spline gage that's available in plug and ring models, is the subject of Bulletin SP615 from Vinco Corp. It's yours on Inform-A-Gram No. C34.

Portable precision grinding tools and small hole drilling equipment appear in Bulletin G-60-C offered by Dumore Co. Check Inform-A-Gram No. C35.

"Tu-Lip" counterbores from Weldon Tool Co. are fully described in Bulletin TCR-2-61. Mark Inform-A-Gram No. C36.

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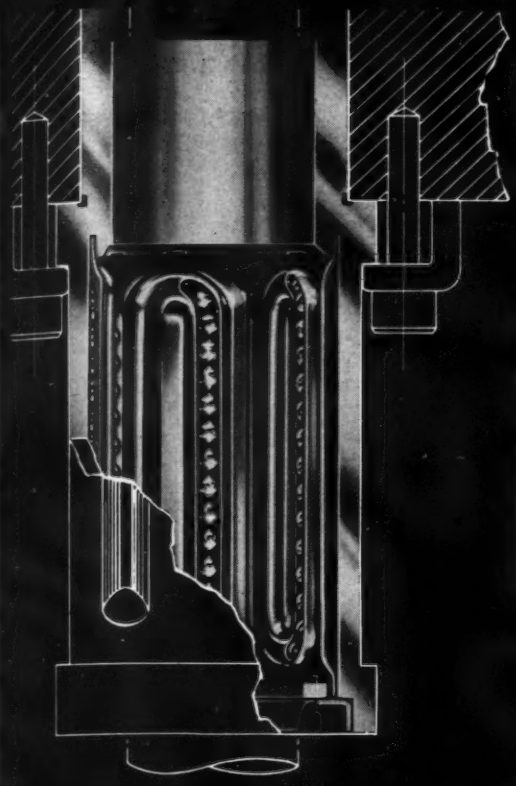
CIRCLE INFORM-A-GRAM KEY NO. 582

CIRCLE INFORM-A-GRAM KEY NO. 59



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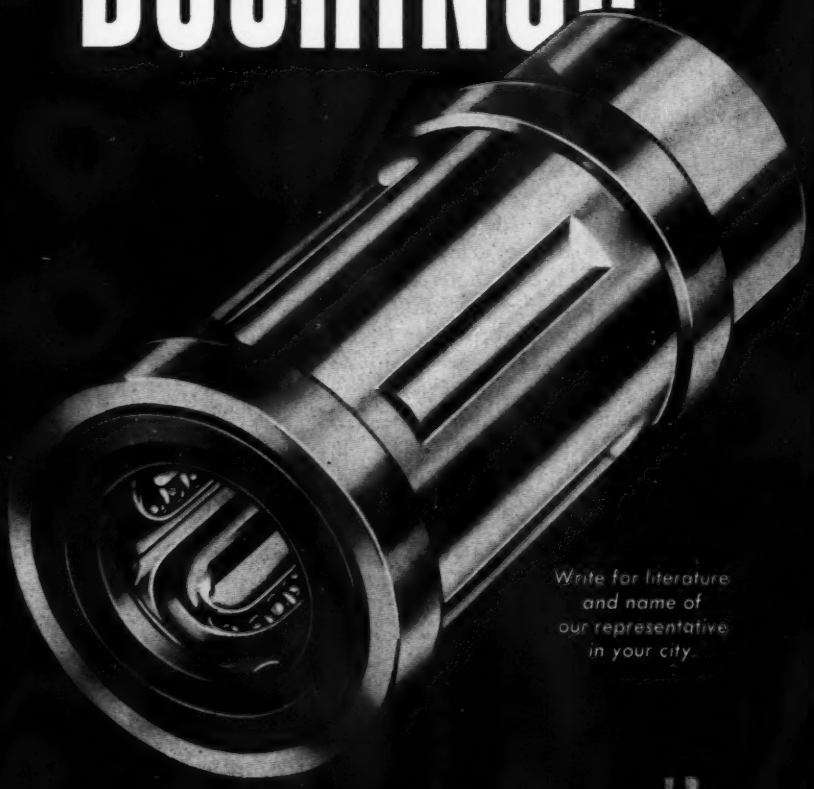

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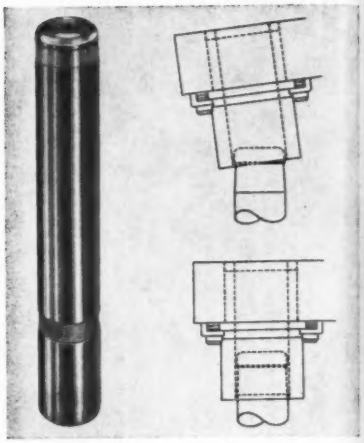
T&P Product News

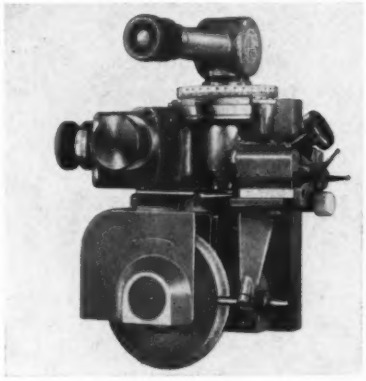
Piloted Guide Post

A newly designed die set guide post assures easy alignment even when the punch holder is not placed squarely on the post. The relieved pilot section just below the post top consists of a narrow band with a tapered undercut for maximum guide. As the punch holder is positioned, the bushing hesitates on the pilot section and comes into alignment with the post via pivot action. The new posts are available for all die sets from Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. Write them or circle Inform-A-Gram No. P1.



Optical Wheel Dresser

Optidress, a new attachment that mounts to practically any standard surface or tool and cutter grinding machine, dresses grinding wheels precisely. It has built-in 10X microscope with a radius reticle and a 6 min vernier for accurate setting of the diamond. Micrometer cross slides permit the dressing of any combination of radii and angles into an intricate form on the wheel. Trial and error methods are eliminated, and radii and angles blend perfectly. Parker-Hartford Corp., Hartford, Conn., considers speeded-up production on limited runs as one of the major benefits of Optidress. Write for more information, or circle Inform-A-Gram No. P2.

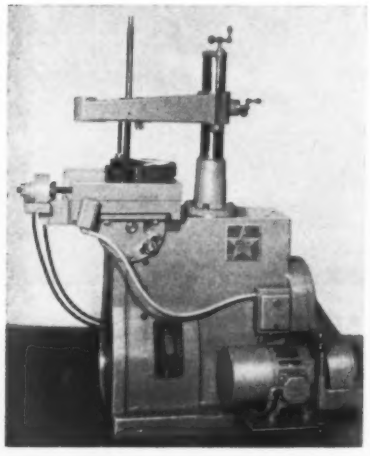


Electrostatic Chucks

New electrostatic rotary chucks solve the problem of holding flat, ring-shaped parts for surface grinding. The chucking system will hold any conductive material including brass, copper, aluminum, stainless steel, and beryllium for surface grinding and machining. It will also hold flat sections of magnetic materials with uniform tension for precision finishing. Use of electrostatic chucking, even on magnetic materials, completely eliminates residual magnetism in finished parts. The Electro-force system consists of the electrostatic chuck itself, compact electrical control apparatus and a mist coolant unit. Write Electroforce, Inc., Fairfield, Conn., or check Inform-A-Gram No. P4.

Automatic Feed Keyseater

An improved automatic feed keyseater produces precision keyways up to 1¼″ wide and 9″ long in record time. Star Cutter Co., 34500 Grand River Ave., Farmington, Mich., recommends it for toolrooms and low and medium-rate production runs. Cutter bar speeds of 15 to 33 strokes/min are obtained by a V-Belt and step pulley arrangement. Table feeds are adjustable from 0.001 to 0.012″/stroke. Cutter bar stroke is adjustable from 3¼ to 9″ by setting an eccentric offset. The machine has a 17 x 18″ T-slot table. Accessories include OD and ID centering plates with removable bushings and two sizes of work clamping bars. Write Star, or check Inform-A-Gram No. P3.



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FREE CATALOG #208

on Work Holding Tools For Production, Tooling, Maintenance

Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises and adjustable angle plates are illustrated and fully described in this new PALMGREN Catalog #208. It shows the *ONLY* complete line of work holding devices available anywhere. Designed for production, tooling and maintenance work, it shows over 70 different models and types, with jaw sizes from 1½" to 8". Ask for your FREE copy of this catalog today, it shows the complete line and prices.

137

No. 2B Heavy duty 4" Angle Vise

No. 84, 8" Rotary Table

PALMGREN PRODUCTS

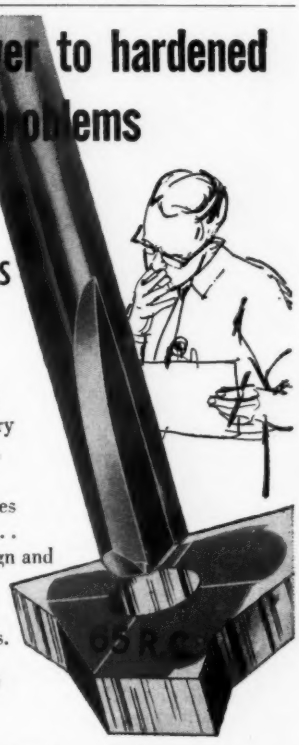
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 612

The ONE answer to hardened steel drilling problems

FORD

HI-ROC CARBIDE DRILLS



Give these FORD "HI-ROC" drills a trial run in your shop. See how many *more* accurate holes you will drill before regrinding is necessary . . . even in metals to 65 R.C. and 280,000 PSI tensile. Choose from 50 standard sizes in lengths from 1½" to 7" . . . or have FORD engineers design and produce "HI-ROC" drills, ground from solid carbide, to your specific requirements.

WRITE FOR BULLETIN 906

Rotary FORD Tools

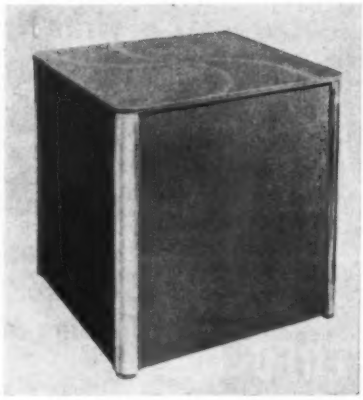
M. A. FORD MFG. CO., INC. Dept. TP-761
1545 Rockingham Road, Davenport, Iowa
Manufacturers of Precision Cutting Tools

CIRCLE INFORM-A-GRAM KEY NO. 613

Product News

Machine Base or Tool Stand

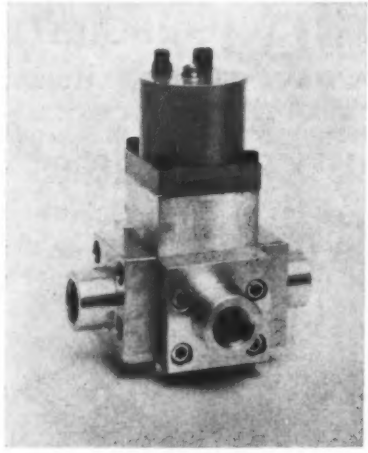
It fits all types of applications. That's why it's called the name Omni-Base. This all purpose heavy-duty machine base is made of four steel panels combined with four extra strong aluminum extruded legs of the stress-lock design. The rigidly constructed base withstands a static load of 20,000 lbs. Made by Marvco Tool & Mfg. Co., 3831 Podlin Drive, Franklin Park 8, Ill., the units come in sizes from 24 x 24 x 24", in one inch increments, to 60 x 60 x 60". Whatever the user specifies is ready in stock. Among the unit's



varied applications are assembly table, automation machinery, service counters, machine, pump or motor enclosures and tool stand. Write for particulars, or circle Inform-A-Gram No. P5.

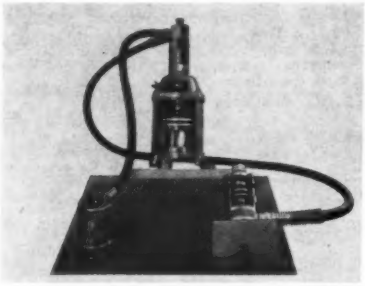
Four-Way Directional Valve

Spherotor rotary directional control valves feature very low pressure drop and a tight seal. They are designed for use with oils and non-corrosive fluids or lubricated air, and are available in ¼, ⅜, or ½" pipe sizes. The Spherotor rotary "no leak" valve can now be indexed by a new midget Rotac manufactured by Ex-Cell-O Corp., Greenville, Ohio. With shop air at 100 psi the Rotac will provide sufficient torque to index the Spherotor 4-way valve operating a 2000 psi hydraulic circuit, or a hydraulic pilot circuit so the Rotac can be used. Additional information about the valves may be had from Sarasota Precision Products, Inc., 5757 McIntosh Rd., Sarasota, Fla. Inform-A-Gram No. P6.



Clamping Down

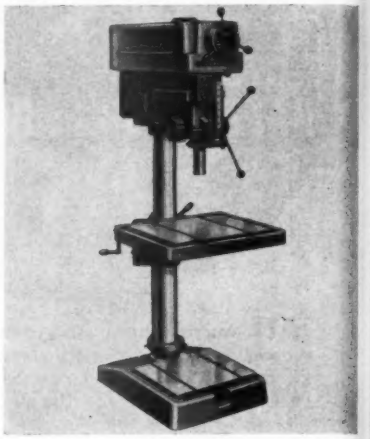
More than 400 power and manual clamping tools were displayed at the ASTME show by the Wilton Tool Mfg. Co., Inc., 9525 Irving Park Rd., Schiller Park, Ill. Highlight of the showing was the company's new Midget PowRlock, illustrated, a power clamping tool for securing electric and electronic parts, control mechanisms, aircraft and missile parts. Also seen was the RX-45 milling machine vise, a low-cost accurately machined vise for smooth, positive clamping action. Low-Boy PowRarm, a 5½"



positioner that brings the work closer to the bench and allows faster work, was also on view. Write Wilton about these and their many other clamping tools, or circle Inform-A-Gram No. P7.

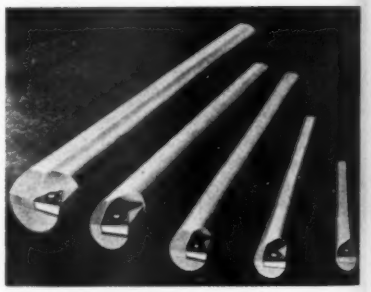
Heavy Duty Drill Presses

Heavy duty drill presses work holes to ⅞" in steel and 1⅛" in cast iron on a production basis. They're available with choice of two countershaft drives: positive power variable speed, or step pulley models with 5 to 10 speeds.



The spindle speed range is 150 to 2000 rpm. Other features are 3 MT spindle with 6½" travel, 4" ground steel column, 19½ x 22" table, choice of hand feed or gear driven power feed. Write Clausing Division, Atlas Press Co., Kalamazoo, Mich., or check Inform-A-gram No. P8.

Less Chatter, Less Deflection

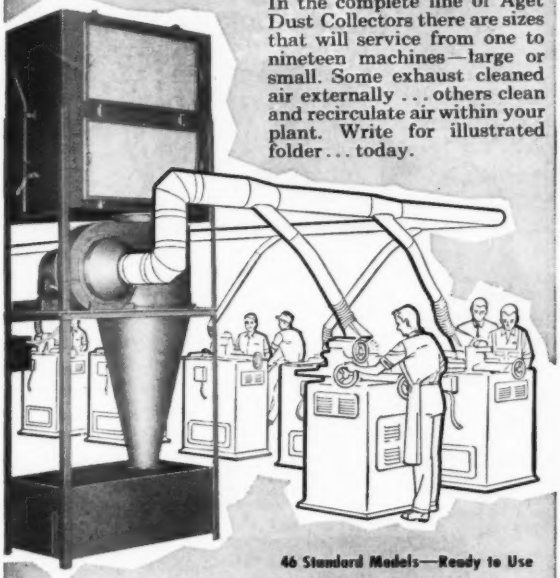


Better finish and straighter holes are attributed to new small boring bars. They feature solid Kennametal shanks, three times as rigid as steel. BB-700 K-Bars are said to practically eliminate chatter, reduce vibration and deflection. Kennametal, Inc., Latrobe, Pa., produces the bars in ⅜, ½, ⅝, ¾ and 1" dia and 6, 8, 10 and 12" lengths respectively. Write the makers, or circle Inform-A-Gram No. P9.

just ONE DUSTKOP STOPS DUST

heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
1394 Church Street • Adrian, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 631

Carbide Tipped and Solid Carbide Circular
CUTTING TOOLS

MEYERS works to tolerances of .0001″; makes tipped cutters as thin as .030″, solid carbide cutters much thinner; diameters of ¼″ and up.

The finest quality and proper grade of tungsten carbide is engineered to the cutter's job. Tools are precision ground and lapped for long life, tipped to carefully tempered and ground bodies.

• It costs no more to enjoy the production advantages of MEYCO tools: "precision" minded since 1888, careful workmanship, well equipped shops and capable design engineers . . . all add up to plus values for you.

SPECIALISTS—Your special problems in the field of cutting, slitting, slotting, under-cutting or form-cutting are solicited.

Write for New Cutter Catalog No. 51

MEYCO W. F. MEYERS CO., Inc.
BEDFORD, INDIANA
A famous name in precision tools since 1888

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IMMEDIATE DELIVERY ON
SOFT BLANK TOP JAWS

BIG SAVINGS

Soft-Blank Top Jaws are made to American Standards and may be used on any chuck having master jaws that are made to these specifications.

Both Medium and Heavy Duty styles are carried in stock and are available for immediate delivery from 1020 steel.

WRITE TODAY for SPECIFICATIONS and PRICES
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HURON MACHINE PRODUCTS INC
P.O. BOX 2274, DEARBORN, MICHIGAN

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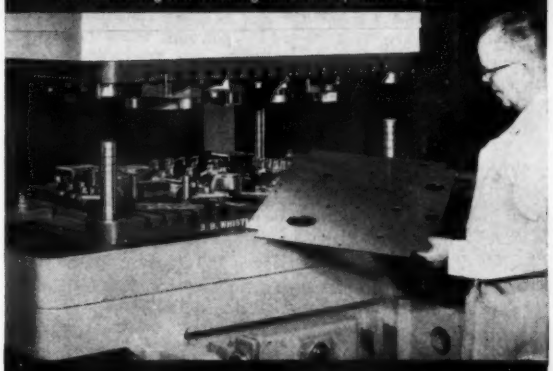
WHISTLER ADJUSTABLE DIES
For Perforating and Notching Materials up thru ¼" Mild Steel



save thousands $$$ in tooling

S. B. WHISTLER & SONS, INC., 748 MILITARY ROAD, BUFFALO 23, N. Y.
mail the following:
☐ Adjustable Die Catalog ☐ Magna-Die Catalog ☐ Custom Die Bulletin
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company _____
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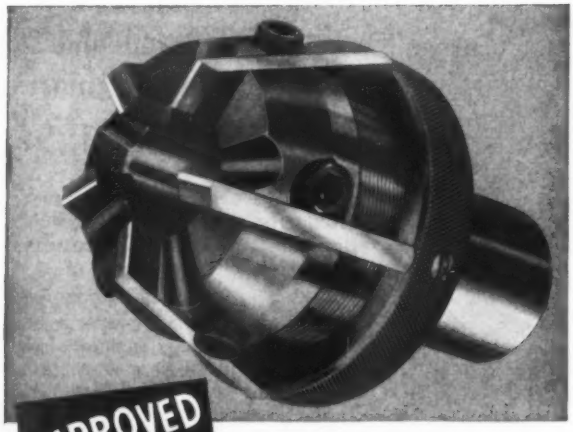
city _____ zone _____ state _____

CIRCLE INFORM-A-GRAM KEY NO. 634



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GENESEE
Adjustable Hollow Mill

There is a size and style Genesee for every hollow milling job. Standard sizes from 0 to 2″, standard with straight or Morse Taper shanks carried in stock.

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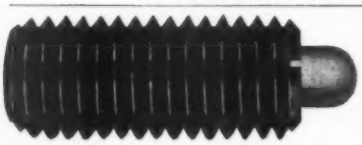
- Simple sharpening method
- High speed steel—cast-alloy —Carbide tipped blades
- Let our Engineering Department solve your Production tool problems

WRITE FOR CATALOG 55P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools

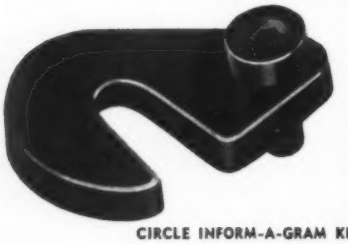
CIRCLE INFORM-A-GRAM KEY NO. 641



SPRING PLUNGERS are now available in four types and thirty-four sizes. Black Pentrate Nose with standard spring pressures, 6-32 thru 1″-8 threads. Cadmium Plate Nose with light spring pressures, 6-32 thru 1″-8 threads. Black Nylon Nose with standard spring pressures, 8-32 thru 5/8″-11 threads. White Nylon Nose with light spring pressures, 8-32 thru 5/8″-11 threads. Northwestern Tools, Inc., 122 Hollier Ave., Dayton 3, Ohio.

PLASTIC BALL KNOBS with brass inserts are now available in four diameters and twelve thread sizes. 3/4″ diameter with 10-32 threads. 1″ diameter with 1/4-20, 1/4-28, 5/16-18 or 5/16-24 threads. 1 3/8″ diameter with 3/8-16, 3/8-24, 1/2-13 or 1/2-20 threads. 1 7/8″ diameter with 1/2-13, 1/2-20 or 5/8-18 threads. Northwestern Tools, Inc. 122 Hollier Ave., Dayton 3, Ohio.

SWING "C" WASHERS complete with shoulder screws, are now available in four sizes for 3/8″, 1/2″, 5/8″ or 3/4″ bolt sizes. Write or call today for your free new 16-page cataolg. Catalog includes tracing templates of jig and fixture components. Northwestern Tools, Inc. 122 Hollier Ave., Dayton 3, Ohio.



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PRESCRIPTION FOR BETTER TOOLING

Rx CarrLane Recommends

NEVER FAIL KNOB AND KNOB ASSEMBLIES IN CAST IRON OR ALUMINUM

TAKE THESE FOR EASIER QUICKER ASSEMBLY

INSIST ON BALL PINS THE SPACE AGE 'L' PIN. THEY WON'T FALL OUT!

CLAMP ASSEMBLIES OR PARTS — WILL HOLD BETTER LONGER

MILL FIXTURE KEYS LOCATE QUICKLY

WRITE for CATALOG today!

Just a few of the many CARR-LANE items that will put 'sick' tooling back on its feet! Let CARR-LANE be your stockpile of Jig and Fixture components you'll get 'em faster and of better quality from CARR-LANE

Carr Lane

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4200 KRAUSE COURT
SAINT LOUIS 19, MISSOURI

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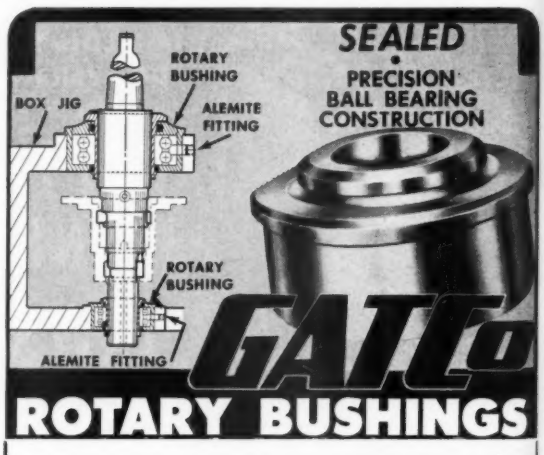


ROTARY BUSHINGS

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

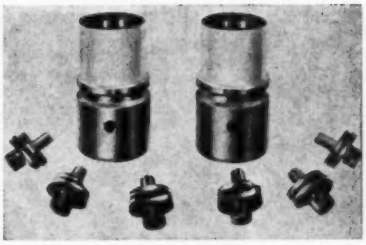
GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., PLYMOUTH, MICH.
GLenview 3-2295

CIRCLE INFORM-A-GRAM KEY NO. 644

Product News

Time Saver Die Set Bush

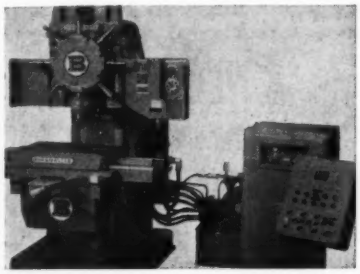
A new group of insulated demountable die set bushings are time savers. They allow machining of mounted dies via electrical discharge. By using the insulated bushings in a die set and mounting an expendable punch or copper electrode directly on the production punch, the die can be machined to required accuracy by electrical discharge. The bushings are said to withstand electrical potential exceeding 1100 volts far more than needed for electrical machine purposes. Die sets



equipped with the new insulated bushings can be put into production use after machining the die by replacing the insulated clamps with standard steel clamps. Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill., stocks the bushings in 1, 1¼ and 1½" sizes. Write, or check Inform-A-Gram No. P10.

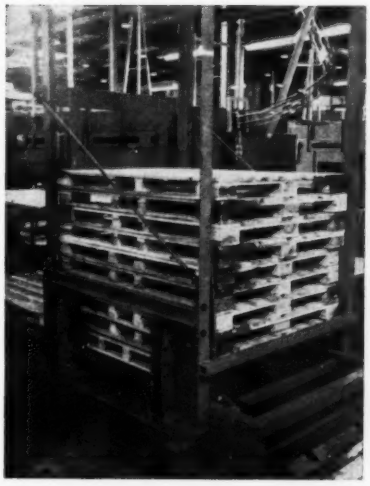
More Tape Control

Another major control systems manufacturer has joined the suppliers of numerical control to Burgmaster turret drills. Sperry Gyroscope system employs linear coil transducers to pinpoint the measurements that determine the final X-Y positions of the table. The speedy, smooth positioning and accurate system is unaffected by any slight mechanical anomalies caused by the transport mechanism. Accuracy is held within 0.0005 over the entire table length, repeatable to 0.0002. No computer is required to program the job for tape preparation. It takes about 1 min per hole to program the job, 45 holes/min to punch the tape, and ⅜ min per tool to set up. Write Burgmaster Corp., 15001 Figueroa Ave., Gardena, Calif., or mark Inform-A-Gram No. P11.



Easy Pallet Handling

A new semi- or fully-automatic system dispenses single empty pallets from a pre-loaded magazine by manual demand or indexed automation. The machines can easily be adapted to existing conveying systems or are offered as a unitized system. It's credited with reduction of manual handling of pallets, cutting of pallet maintenance, reduction of truck time and mileage, improved pallet flow to shipping area and improved pallet flow to loading area. With slight modifications, this dispensing machine may be converted to an empty pallet stacker. Write H. L. Bushman Co., Inc., 100 W. Central Ave., Roselle, Ill., or mark Inform-A-Gram No. P12.



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SPECIAL RH & LH
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Also in Stock:
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• SPECIAL REAMERS
• EX. LONG DRILLS
Write Today for WALL CHART Special Taps Also Made to Your Print Specifications
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Baldy sez... There's no magnetic distortion in BALD EAGLE Magnetic Sine Tools.
LOW COST
5" Magnetic
Sine Bar $160.00 with case.
Accurate to .0002" in dimensions and parallelism. Positive locking with end and side plates makes it ideal fixture for production, inspection, tool room.
The complete Bald Eagle line starts at $26.50 F.O.B. St. Paul. Order your sine bar or plate from your dealer or direct.
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HIGHEST PRECISION AT LOW COST!
DIAL CALIPERS
VERSATILE • TIMESAVING • EASY TO READ
from $38.60 (Less Case)
Featuring Adjustable Tolerance Dial
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New
ARMSTRONG CATALOG
Quality Tools for Industry

New ARMSTRONG General Catalog No. 700, showing the complete ARMSTRONG Line including approximately 330 new ARMSTRONG tools added in these categories:

- Tool Holders
- Set-Up-and-Hold-Down Tools
- Tool Bits
- Wrenches
- Ratchet Wrenches and Sockets
- Miscellaneous Hand Tools
- Pipe Tools

Anyone who uses or buys hand tools or shop tools needs this free ARMSTRONG Catalog No. 700 showing these important additions as well as thousands of other ARMSTRONG tools.
Write direct, or phone your local ARMSTRONG Distributor (Distributor name furnished upon request).

ARMSTRONG BROS. TOOL Co. 5220 W. Armstrong Ave. Chicago 46, Illinois

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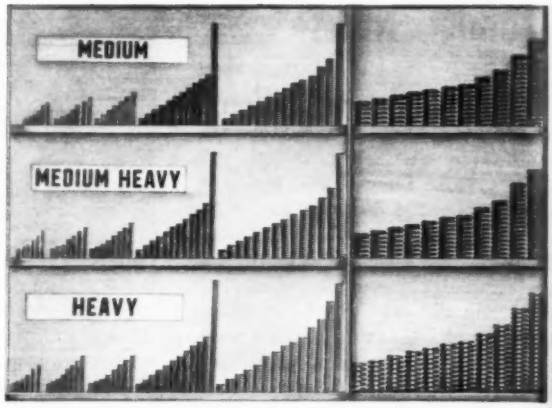

Die Springs - CHROME VANADIUM STEEL

6001

Fine quality die springs carried in stock —wide selection of hole and rod sizes, lengths and deflections. Three pressure ranges — medium, medium-heavy, heavy. Long life reduces down-time.

Write for free list of stock sizes, prices, and name of nearest distributor.

Raymond Manufacturing Division
Associated Spring Corporation
Corry, Pennsylvania

CIRCLE INFORM-A-GRAM KEY NO. 663

find cracks, leaks, defects with push-button ease!

ZYGLO®
BLACK LIGHT portable fluorescent penetrant inspection kit
by MAGNAFLUX

IDEAL FOR
- Finding oil leaks
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FIRE SAFE: All materials have high flash-point. Spray cans eliminate waste, spillage, contamination.

Take the guesswork out of testing! ZYGLO, the *most sensitive* fluorescent inspection method available, makes every crack glow. Use it anywhere —in the shop, in the field.

Complete ZYGLO KIT shown above including 100 W. BLACK LIGHT **$125.00** F.O.B. CHICAGO

Order Today or Write for Data. New illustrated bulletin gives complete facts on ZYGLO Kit and replacement materials.

MAGNAFLUX CORPORATION
7339 West Ainslie Avenue
Chicago 31, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 662

ANOTHER REPORT FROM THE ALMCO ALBUM OF NEW PRODUCTS

Here's the NEW answer to
LOW COST SMALL LOT BARREL FINISHING!

Small in size, big in performance . . . that's the new ALMCO *Super Mite* Barrel Finisher! It's ideal for laboratories, job shops, research departments and manufacturers with limited finishing needs!

Super Mite Model DBM-10

- **COMPACT.** 26" high x 30" long x 18" wide; ½ cu. ft. capacity barrel has cam type door.
- **PORTABLE.** One man carries. Weighs 96 lbs.
- **VERSATILE.** Gives quality finish on a large variety of parts.
- **LOW COST.** Easy to buy. Saves money, too!

ALMCO *Super Mite* DBM-10 is especially intended for plants and departments processing small lots of parts. It handles close tolerance jobs and low micro-inch finishes; speedily performs all deburring and finishing work. **Write today** *for full performance information!*

FREE!
NEW PRODUCT ALBUM
Gives full information on new Almco Supersheen Systems. Describes new and better machines, methods and media. Write today!

ALMCO
QUEEN PRODUCTS DIVISION
King-Seeley Thermos Co.
147 Marshall Street
Albert Lea, Minnesota

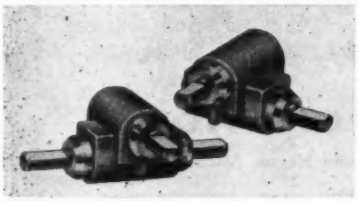
CIRCLE INFORM-A-GRAM KEY NO. 664

Product News

Less Heat

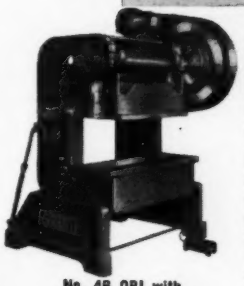
Excessive heat buildup, an old evil in tool grinding, has been eliminated with Turbogrind diamond wheels. Heat in both the work piece and the bond has been reduced via integrated vanes that vortex laminar air into an effective coolant flow. The redesigned thinner core, strengthened by the vanes, cools faster and is self-dressing. Wheel life has been increased. Turbogrind diamond wheels can be used in wet, mist or dry grinding. Contact United States Diamond Wheel Co., 835 Illinois Ave., Aurora, Ill., or check Inform-A-Gram No. P13.

Two Angle Drives



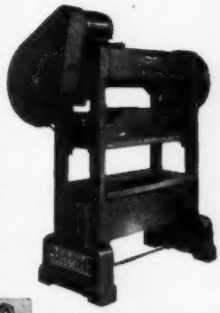
New 9056HF T-drive and 9056-119 its companion right angle drive, feature ¼" dia shaft cut to a 1/16" flat for a stronger attachment to coupling ends. The new adapters are primarily used with flexible shafting. Variety of uses is limited only by the user's imagination. The drives feature aluminum alloy housing, steel gears, and oilite bearings. They have an ultimate static torque capacity of 25 in-lbs with a backlash of 6°. Stock gear ratios are 1:1, 1:2, and 2:1. Write F. W. Stewart Corp., 4311 Ravenswood Ave., Chicago 13, Ill., or check Inform-A-Gram No. P14.

High-Output with ROUSSELLE
DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes

STRAIGHT SIDE – Die space up to 24 in.; bed space up to 6 ft. between uprights.

SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

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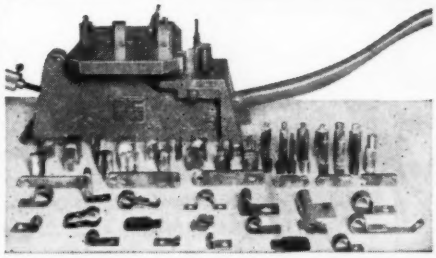

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BENDER-CUTTER
CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

ALSO AIR OPERATED MODELS

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No distortion — even on ⅛" stock!
MODEL "C"
KNURLMASTER
Hand Knurler

For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

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PEM ENGINEERING & MANUFACTURING CORP.
DOYLESTOWN, PENNSYLVANIA

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DAKE

Movable Frame Presses

...make awkward, hard-to-handle jobs easy...

Difficult straightening, pressing, clamping, forming, and testing operations are made simple with this versatile Dake hydraulic press. The entire pressing frame can be rolled out of the way to permit the placing of large, heavy, or bulky work on the pressing table. And the powerful, self-contained workhead is movable in every direction—left, right, up, down—to permit positioning over the point where pressing force is required.

Standard model, single acting, movable frame presses are available for air or electric operation in capacities from 25 tons to 150 tons—other models and designs in capacities from 200 tons to 300 tons. For detailed information, send for Catalog 424.

DAKE CORPORATION

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HARDENED and GROUND HSS BLANKS

Any decimal diameter — any length. Mirror finish surface to gage tolerance.

Many uses —

—core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

Write or phone DRexell 6-4223 for price list D-3

WILLIAM T. HUTCHINSON CO.

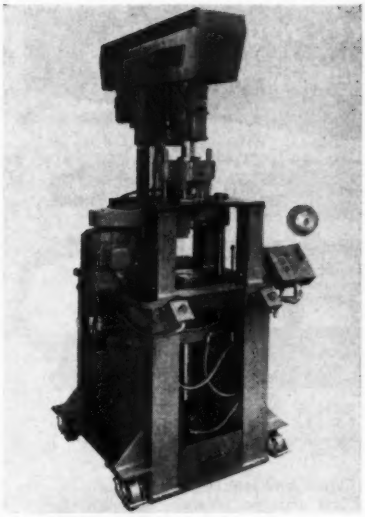
53 Brown Ave., Springfield N. J.

CIRCLE INFORM-A-GRAM KEY NO. 683

Product News

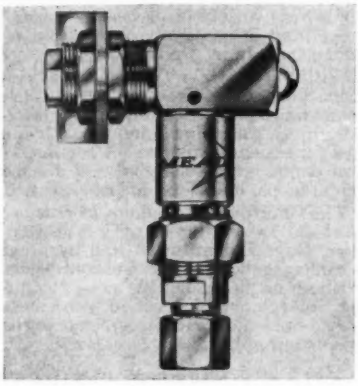
Modified Multi-Tap

In one application, a newly modified Multi-tap machine produces 1920 parts/8 hr day at 100% efficiency, and performs several operations in one work cycle. The unit is equipped with a Wisconsin eight-spindle fixed center tapping head and floating tap holders. It's safety engineered so that a work cycle cannot start if a workpiece is not properly located in the nest. The part is loaded into the nest, and when palm buttons are depressed the nest is rapid traversed upward to the cutting head. The part is clamped at the end of the rapid traverse stroke and is then fed into the cutting (facing) head. Upon completed feed stroke, the



tapping unit goes into action. For specifics write Wisconsin Drill Head, 4975 N. 124th St., Butler. Wis., or circle No. P15.

Interlock Limit Valve



Applications in circuits that call for one limit valve plunger to stay depressed throughout a series of operating cycles should find Model 408 interlock limit valve helpful. The valve actuates pilot bleed differential master valves. Bleed duration may be varied to meet circuit requirements. Even while Model 408 remains depressed, flow direction may be changed via another limit valve. Write Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill., or circle Inform-A-Gram No. P16.

Gaging in Millionths

Many producers of miniature precision parts will welcome the advent of thin blocks. Croblox 28 "thin" set includes blocks ranging from 0.010 to 0.090 in A+, AA and laboratory master accuracies. Another Croblox series includes 2 sets, one of 11 and another 21. They're available in five and ten millionths steps in laboratory master grade. All blocks are rectangular style. Individual blocks are available from these 2 sets in sizes from 0.100 to 0.100005 and 0.1000010" etc. through 0.1001" laboratory master grade. Linearity of scale on electronic comparators or other instruments can be

checked in five or ten millionths steps to an accuracy of less than one millionth of an inch. Prices of these gage blocks may be obtained by writing to Webber Gage Co.; 12900 Triskett Rd., Cleveland, O.

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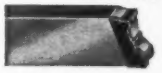
"MS" Port Cutters

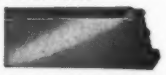
MS 33514: Carbide Tipped integral end pilot

MS 16142 "SAE"; Carbide Tipped interchangeable end pilot and reamer

External Flat Form Tools



MS 33656 E and G; MS 33657E and S Stocked in Carbide Tip and H.S.S.



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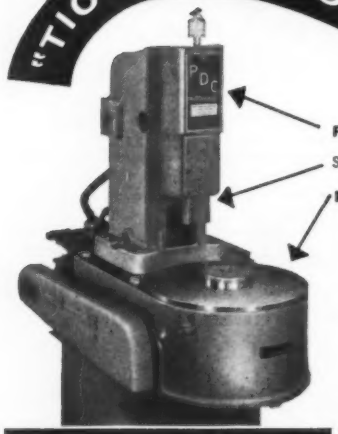
CIRCLE INFORM-A-GRAM KEY NO. 701

"TIC-TOCK AROUND THE CLOCK"...



PDC Air-operated Toggle Action Press Head Shown

Standard risers available to increase shut height

PDC-EMUC-15 Electric Drive Index Table

PDC *"AUTOMATIC"* DIAL ASSEMBLY PRESS ... Range to 6 Tons

A PROVEN FACT: the PDC Automatic Dial Assembly Press *increases* production and *lowers* costs, and has proven itself in production for many years. It can be either hand-fed or hopper-fed.

This Standard Dial Assembly Press is for operations such as

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- Staking
- Riveting
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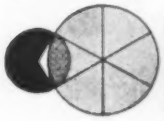
- Forming

This machine can also be furnished with spinner heads, rivet hammers, punch presses and many other types.

Write **TODAY** for new Catalog 60, for designers and engineers.



PRECISION DETROIT COMPANY
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CIRCLE INFORM-A-GRAM KEY NO. 702

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Precise measurement to 0.0001" and 1 min. of arc
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Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

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- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

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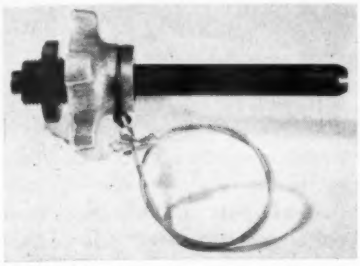
CIRCLE INFORM-A-GRAM KEY NO. 703

Product News

Adjustable Ball Pin

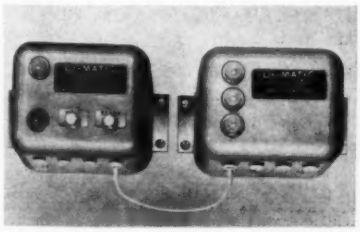
New durable alloy steel pins have a single shear strength ranging from 4000 to 65,000 lbs. They are adjustable to predetermined length and can be locked with a knurled locknut. The pin canno be removed without first depressing the plunger. When the handle



is correctly adjusted, the pin can be inserted and locked with a minimum of end play. Locking is accomplished via balls that protrude from the diameter of the pin. A button on the end of the pin can be depressed to release these balls into the diameter of the pin. Write Carr Lane Mfg. Co., 4202 Krause Ct., St. Louis, Mo., or Inform-A-Gram No. P17.

Detects Overloads

An adjustable press overload detector is now part of the Di-Matic system from Di-Matic Controls, Inc., 100 Beadel St., Brooklyn 22, N.Y. In case of misfeed, stock buckling, material pile-up etc., the basic, electrically controlled system instantly disengages the press



clutch. This new accessory releases the clutch within one cycle following an overload. Sensitivity may be decreased with material thickness increase. The unit fits any basic model Di-Matic press control of the 100 or 200 series. Write the makers, or mark Inform-A-Gram No. P18.

EXPERT

Performance is what determines true cost of milling cutters. That's why each

CARE

Barber-Colman cutter is made with extra and expert care, in every step of manufacture. A cheap

cutter isn't worth the setup and tool change cost because of short tool life and improper operation. Barber-Colman quality gives you maximum return on the investment that really counts—your machine tools. Buy them with confidence, from your Barber-Colman representative.

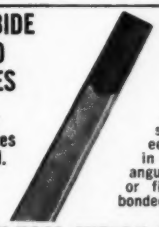
BARBER COLMAN

BARBER-COLMAN COMPANY 77 Loomis St., Rockford, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 711

CARBIDE HAND HONES

Dealer inquiries invited.



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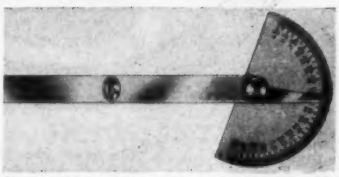

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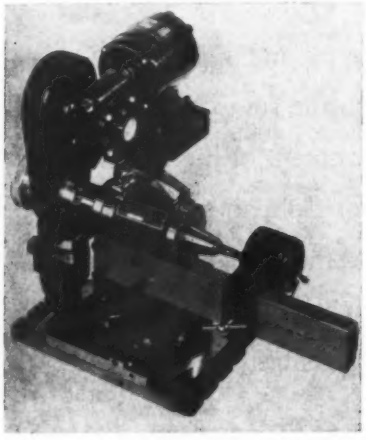
CIRCLE INFORM-A-GRAM KEY NO. 714

Product News

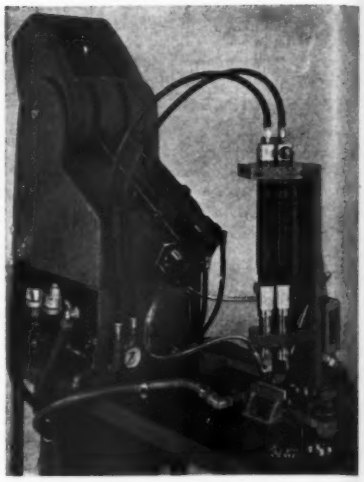
No Deflection or Distortion

A new support bar with 2¼ sq in cross section practically eliminates any center deflection or distortion in grinding long tools. Size and rectangular shape of the support provide maximum rigidity for supporting the extended center when tools are ground between centers, and for holding bushing type steady rest supports for long tools. A full 6" swing is provided with the new support allowing grinding of larger diameter taps and other tools. The new support is available only on new fixtures from R-O Mfg. Co., 31171 Stephenson Hgwy., Madison Heights, Mich. Existing fixtures cannot be properly converted. Write the manufacturer, or circle Inform-A-Gram No. P19.



Automatic Screwdriving

Two air-fed screwdrivers with Tru-Tork nose pieces and a special double track oscillating hopper with two metering devices are featured in a new dual spindle automatic screwdriving machine. A shuttle-type fixture pushes the part into position where it is held firmly by a nylon pressure pad. When the part is centered under the driving head, a limit switch initiates the drivers. Screws are simultaneously metered and driven while the operator positions the next part on the fixture. Completed parts unload into a chute automatically. The machine operates driving heads on normal shop air, uses 40 lbs pressure for metering device operation. Write Clyde Engineering & Manufacturing Co., 937 E. 10 Mile, Madison Heights, Mich., or mark Inform-A-Gram No. P20.



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HANDY RISER BLOCKS

- Give heights from ⅜" to 2⅜" in ⅛" increments.
- Cut setup time by eliminating haphazard blocking.
- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

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By ..... Title .....
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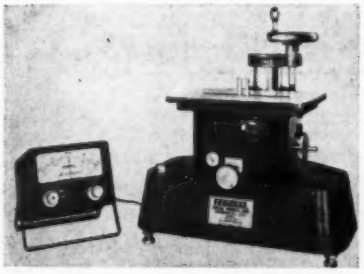
City ..... Zone ..... State .....
Open account shipments to rated companies. Otherwise, payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax.

Product News

Quick Pressure

A new quick-acting pressure unit lends itself for clamping jigs, fixtures and other tooling. A simple twist of the handle unlocks the push-pull release. A quick turn clamps the work. The standard unit has a clamping range up to 8". The bar has a plain soft end for machining or other chosen applications. The compact mounting block allows mounting in close places. Due to the specially designed lock, there is no slippage, according to Universal Vise & Tool Co., Parma, Mich. Circle Inform-A-Gram No. P21.

Checks Accurately



An electronic comparator checks master rings and discs to within 2 millionths accuracy. It can measure ID from 0.040 to 4.760" and OD from 0 to 3.5". These measurements are made with constant gaging pressure by contacts that are mounted on a free-floating unit. Two scales are immediately available by switching—11,200X magnification (0.000010 graduations) and 2200X magnification (0.000050 graduations.) The transistorized, battery powered amplifier assures instant operation with no fluctuation of voltage. The portable amplifier can be used with an electronic gage head for other measuring applications. Write Federal Products Corp., Providence 1, R.I., or check Inform-A-Gram No. P22.

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Side line salesmen wanted. Repeat order business

REPLACE SOLID BUSHINGS with JERGENS ADJUSTABLE BEARINGS

JERGENS "LIVE" BUSHINGS

- Increase Speeds, Feeds, 200%
- Reduce Tool Breakage
- Eliminate Bushing Wear
- Use Economical Carbide Cutters
- Provide Greater Precision
- Available for ½" to 6½" Shafts
- Will stand greater sidewall pressures

Get time, tool, and money-saving advantages by replacing solid bushings with Jergens adjustable roller bearing units. Available for ½" to 6" shafts or with straight roller bearings where space is a factor in ½" to 2" shaft sizes. Write today for complete information and authentic case histories.

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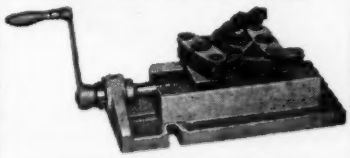
"the All-Purpose Vise"



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- Four sizes—Two models

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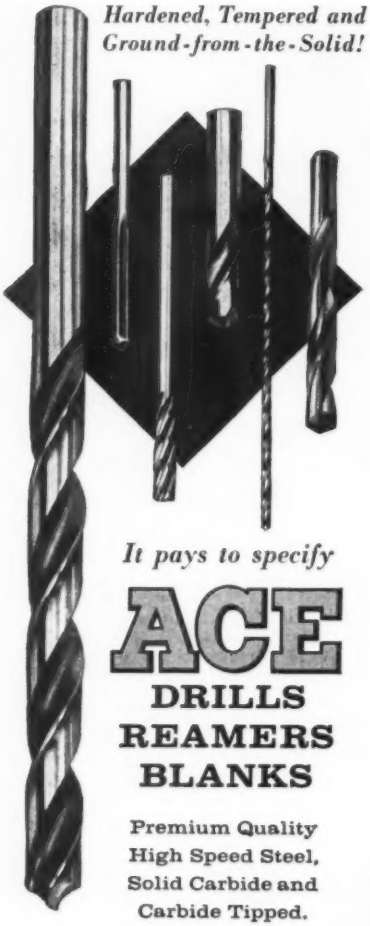
Hardened, Tempered and Ground-from-the-Solid!



It pays to specify

ACE

DRILLS
REAMERS
BLANKS

Premium Quality High Speed Steel, Solid Carbide and Carbide Tipped.

ACE DRILL SETS

Standard stock sets include Fractional, Wire and Letter size drills, packaged in convenient folding index cases.

ACE BLANK SETS

Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits available in standard Fractional, Wire and Letter series sets.

Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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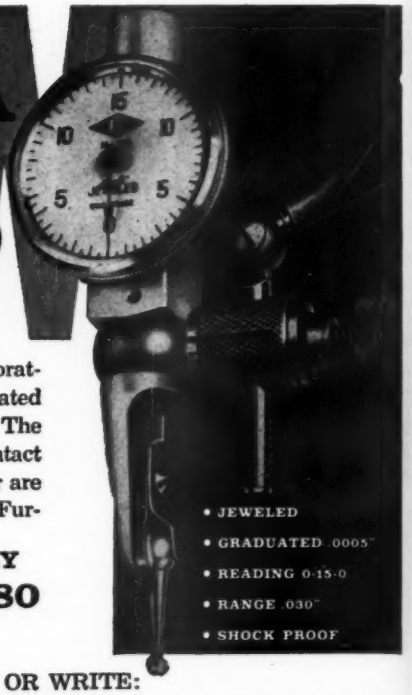
NEW ALINA No. 88



A fully reversible indicator incorporating a clear easy-to-read dial, graduated in half thousandths of an inch. The TWO hardened chrome plated contact points of .030" and .100" diameter are equipped with a non-slip ratchet. Furnished complete with a universal shank, body clamp, and plush lined steel case.

ONLY $21.80

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ALINA CORPORATION

122 East Second Street, Mineola, Long Island, New York

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CAM milling/JIG boring

A SPECIALIZED CAM MILLING SERVICE, JIG BORING, SPOT WELDING, CONTRACT PRODUCTION

EXPERIMENTAL DEVELOPMENT

CAM CALCULATING SERVICE

Write for catalog 55-C

EISLER ENGINEERING CO., INC.
Chas. Eisler, Jr. President
732 So. 13th St
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CIRCLE INFORM-A-GRAM KEY NO. 743

LIFTING DEVICES

for
FAST • SAFE • BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS

H. L. BUSHMAN CO
100-A W. Central Ave
Roselle, Illinois

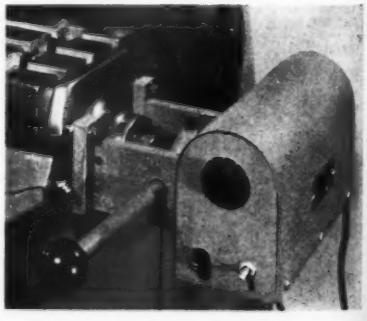
CIRCLE INFORM-A-GRAM KEY NO. 744

PROTECT YOUR FUTURE
BUY
U. S. SAVINGS BONDS

Product News

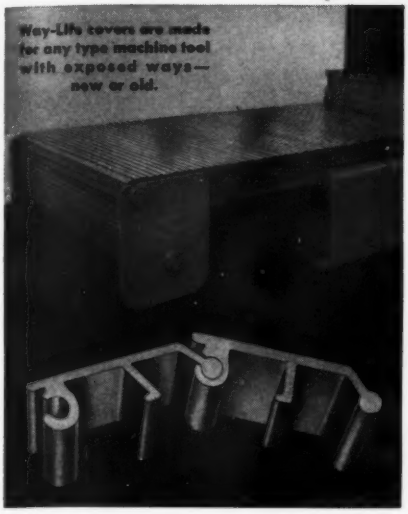
Fits on Table

With a new rotor power feed attachment, the operator can do deburring and other work while the machine is cutting. A special feature allows quick hand operation when power is not needed. The unit can be attached to rotary tables, vertical mills, and grinders. It lends itself to other applications that require power feed via special adapters. For further details write M & M Tool & Mfg. Co., 1124 East Third St., Dayton 2, Ohio, or check Inform-A-Gram No. P23.



Protection for Man and Machine

FUTURMILL'S "*Way-Life*" WAY COVERS



Way-Life covers are lightweight—yet very strong. The extruded aluminum sections are ribbed full length with a full length ball and socket type interlocking hinge.

SAVE THE WAYS—"Way-Life" covers keep chips, grit, dirt and other foreign matter out of the ways and feed mechanisms. The solid aluminum, interlocking sections will absorb a considerable amount of shock and prevent damage to the ways—such as caused by accidental dropping of heavy objects on the ways.

WORK WITH SAFETY—The strength and rigidity of "Way-Life" covers permit operators to walk safely on top of the cover, making machine servicing and job set-up safer and easier. It is impossible for personnel to fall through the cover or become caught or trapped between the ways.

CUT COST & MAINTENANCE—Unlike fabric, rubber, plastic, sheet metal, foil, telescopic, or accordion type covers, "Way-Life" covers will not burn, warp, tear, rust or buckle. They require no auxiliary power since the cover is motivated by table or column movement. No special servicing is necessary.

DRESS UP YOUR SHOP—"Way-Life" covers are *full dress—armored protection* for any machine . . . a complement of utility—economy and cleanliness for any shop.

Write: **FUTURMILL, Inc.** 6360 Highland Road Pontiac, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 754

AUTOMATICALLY

The Model 90FS Universal Automatic Flute Grinder

MAKES TOOLS
With Straight or Spiral Flutes
IN MINUTES

Saves Money Because

FLUTED TOOLS
Cutters • Millers • Taps • Reamers

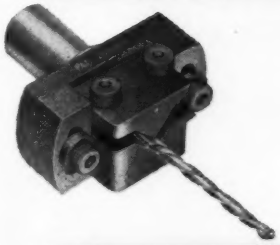
MADE AUTOMATICALLY
are Economical

Get details on Miller and Grinder

WARDWELL Mfg. Co.
3809 Ridge Rd., Cleveland 9, O.

CIRCLE INFORM-A-GRAM KEY NO. 751

ACCURATE SET-UPS FAST!



Accurate, rapid set-ups the first time, every time . . . is the reason Brookfield Tool Holders are now widely used in practically every metalworking plant in the country. With one Brookfield Tool Holder, you can cut your stock of bushings by at least 100. Here's why:

BROOKFIELD TOOL HOLDERS

ADJUSTABLE V JAW holds wide range of tool diameters without bushings or accessories.

AXIALLY TRUE DESIGN makes perfect tool alignment almost automatic.

BALANCED-PRESSURE LOCKING ASSEMBLY maintains uniform seating, eliminates creep or shift.

EASY TO USE — just slip tool in the jaw, tighten, then float tool into dead center and lock.

AVAILABLE IN A WIDE RANGE OF SIZES

MODEL NO.	HOLDING RANGE	SHANK DIA.
BA-10	1/64"–3/16"	3/8"
DA-10	1/64"–1/2"	3/8"
DA-12	1/64"–1/2"	3/4"
GA-12	1/16"–3/4"	3/4"
GA-16	1/16"–3/4"	1"
KA-16	1/8"–1"	1"
KA-24	1/8"–1"	1 1/2"
PA-24	1/4"–1 1/2"	1 1/2"
PA-28	1/4"–1 1/2"	1 3/4"

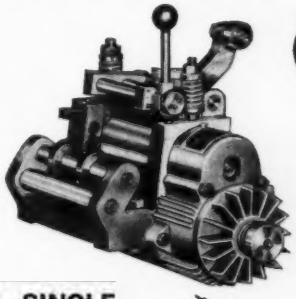
WRITE FOR ILLUSTRATED CATALOG AND PRICES!

BROOKFIELD, INCORPORATED

STOUGHTON 15, MASSACHUSETTS

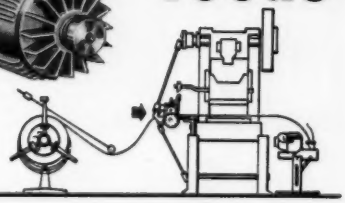
CIRCLE INFORM-A-GRAM KEY NO. 752

FOR HIGH PRODUCTION STAMPING



roll feeds

SINGLE AND DOUBLE



Cooper Weymouth Roll Feeds can push or pull coil stock into stamping presses at speeds up to 450 strokes per minute. Equipped with trouble-free high torque carbide clutch and disc type air cooled brake with twice the usual braking area. Fifteen standard sizes with feed length and stock width capacities up to 12".

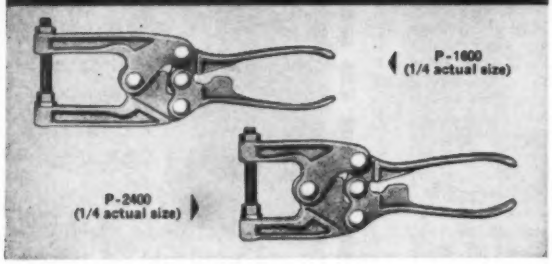
Send for details on this and other Cooper Weymouth automatic production equipment for press rooms.

COOPER WEYMOUTH, INC.

603 Honeyspot Road, Stratford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 753

Another step forward
KNU-VISE TOGGLE PLIERS with 1600 & 2400 lbs. clamping force



In keeping with its reputation for providing the industry's most efficient toggle clamps and pliers, Lapeer Manufacturing Company has introduced new plier models—the P-1600 and P-2400 series.

Long and comfortable handles are a feature of these Lapeer Knu-Vise pliers. With average handload, these pliers provide a clamping force of 1600 and 2400 lbs. respectively. The P-1600 series has a throat depth of 2¼", and throat gaps of 1⅜, 3, 4 and 6 inches. The P-2400 series has a throat of 1¾" x 1¼". Each series is available with two opposing spindles. All models can be furnished with unlocking levers. The pliers are made from steel forgings, heat-treated, and cadmium plated.

Write for more information and remember—LAPEER KNU-VISE GIVES YOU MORE VALUE FOR YOUR MONEY.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

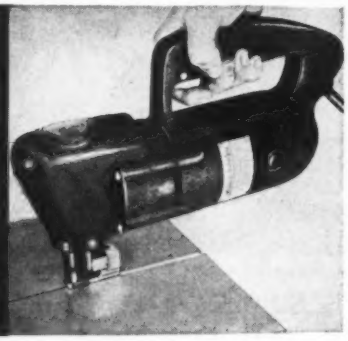
KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**

3064 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION
4438 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7146
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 761

CUT METAL *FAST,* WITHOUT DISTORTION USE MODERN NIBBLERS



They cut 10 gage stainless, 8 gage mild steel, 7 gage aluminum and brass without bending or curling the metal.

They cut 6" (and smaller) radius.

Models are available for cutting corrugated metal, fibre glass and plastic without cracking or chipping. Other models for cutting wire netting, irregular rods, gaskets, etc.

A MODEL FOR CUTTING ¼" COLD ROLLED STEEL AVAILABLE SOON!

Write, wire or call

MODERN MFG. CO., INC.
678 Davisville Rd. • • • Willow Grove, Pa. • • • OLdfield 9-4820

CIRCLE INFORM-A-GRAM KEY NO. 762

The WELLS Model 600 Metal Cutting Band Saw

for Tool and Stock Room Service

•

for Medium Production Jobs

Rugged in design, dependable in operation, the Wells Model 600 is the ideal saw for tool and stock rooms . . . gives excellent service on medium production jobs. Uses ⅝" blade. Adjustable, uniform gravity feed is provided by hydraulic stabilizer and special coil spring. Casters available for portability. Write for Bulletin 260-A.

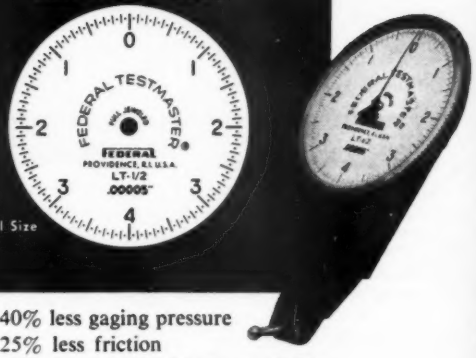
Wells Saws *The Pioneers of Horizontal*
Wells METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1940 Cedar Street, Three Rivers, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 763

new... super-sensitive TESTMASTER®

Min. Grads. .00005"



— 40% less gaging pressure
— 25% less friction
— .0001" grads. model also available

Write for brochure and prices

FEDERAL PRODUCTS CORP.
1237 Eddy Street, Providence 1, Rhode Island

Ask **FEDERAL®** *First*

for recommendations in modern gages... Dial Indicating • Air • Electric or Electronic — for inspecting, measuring, sorting, or automation gaging.

CIRCLE INFORM-A-GRAM KEY NO. 764

Product News

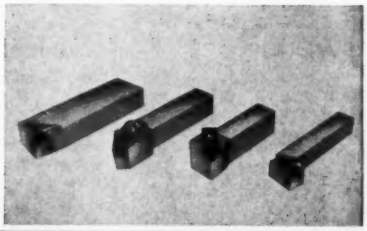
Direct Dimension Reading

Ferranti FI-22 measures the distance between holes and surfaces in two dimensions X and Y to an accuracy of better than 0.001. Answers are flashed on two illuminated digital readout panels, which work like an automobile odometer. Hole locations and surface inspections with the new coordinate measuring machine are reportedly 10 to 20 times faster than those possible with conventional surface plate measuring techniques. One of the unique features of the machine is the use of "floating zeros" that enable inspection to begin anywhere within the 15 x 24"

gaging range. Write The Sheffield Corp., Box 893, Dayton 1, Ohio, or circle Inform-A-Gram No. P26.

Insert Turning Tools

A group of throwaway insert turning tools has been developed especially for use in Warner & Swasey cutter holders, multiple turning heads, and square turrets. The new line of standard tools includes six different holder styles utilizing square, diamond and triangular shaped indexable inserts. The new design incorporates serrated adjustable chipbreaker, low profile, short overhang and carbide shim seats. Also available for the tools are carbide inserts in 5 grades. Write Valenite Metals, Div., Valeron Corp., Box 205, Royal Oak, Mich., or circle Inform-A-Gram No. P27.



The Inform-A-Gram Card which follows page 50 is for your convenience in making inquiries about advertised products and editorial articles.

LEAD HAMMERS—Buy Cook "SHUR-GRIP"

They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

Write for circular and prices

COOK'S LEAD HAMMER SERVICE
68 Massasoit Ave., E. Providence 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 771

Severance ELECTRODE DRESSING CUTTERS

Used by many to re-condition Electrodes without removing from machines—

Down-time is Slashed!

Production is Increased!

Designed to fit most all popular Electrode Dresser power tools.

Special shapes quickly made up.

INVESTIGATE!

It may pay you much!

ASK FOR MORE INFORMATION TODAY!

MIDGET MILLS

CHATTERLESS COUNTERSINKS

BALL SEAT REAMERS

CARBIDE END MILLS

INSIDE DEBURRING CUTTERS

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DISC CUTTERS

DRILL COUNTERSINKS

SPECIAL CUTTERS

REGRINDING SERVICE

Severance TOOL INDUSTRIES INC.
730 IOWA AVENUE
SAGINAW, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 772

A DICTIONARY OF METALLURGY

by A. D. Merriman

G.C., O.B.E., M A., D.Sc., C.I. Mech. E., F.R.S.E.

$25.00

400 PAGES
Profusely Illustrated

Just published February 16, 1959. Prepared by Dr. Merriman, Secretary of the Institution of Metallurgy, Great Britain, this is the most comprehensive work of its kind ever to appear in print.

The Dictionary of Metallurgy provides:

- **7,000 definitions**
- **283 illustrations**
- **236 tables—includes those constants invaluable for reference purposes**
- **An appendix which includes a Table of Common Abbreviations and Symbols, a Table of Abbreviations Used in Foreign Literature, and a Table of Physical Properties of Metals.**

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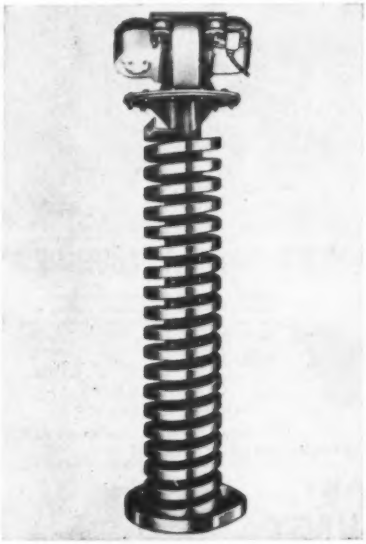
Product News

Spiral Feeder

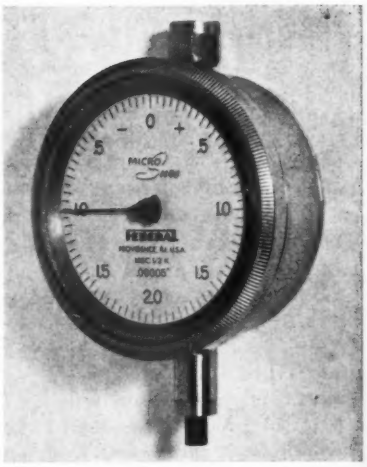
A new spiral feeder is useful for elevating metal parts, cleaning and degreasing tanks, and stamping from presses to tote boxes, as well as handling most bulk materials. Economical cooling by convection or forced air is due to the maximum exposed area of the spiral ramp, in a minimum amount of



floor area. The rotary vibrator spiral feeders operate on 230 or 460 volt, 60 cycle, three phase AC. Syntron Co., 341 Lexington Ave., Homer City, Pa., offers three models with spiral heights from 3½ to 20 ft. Inform-A-Gram No. P28.

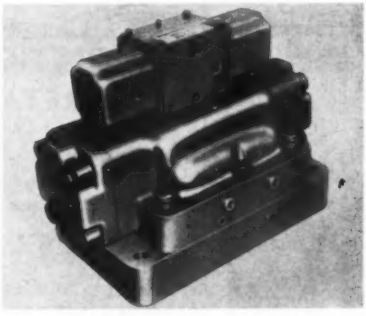
Higher Calibration

Micro-Sure indicator provides high magnification 0.000050 graduations over the full AGD range. It's credited with two to four times the calibration and repeat accuracy of conventional indicators. The indicator is protected against shock in either direction because it follows plunger motion. Micro-Finish of critical surfaces reduces friction to ¼ that of conventional indicators. The unit fits the bill for production gaging where more elaborate measures are usually necessary. Write Federal Products Corp., Providence 1, R.I., or check No. P29.



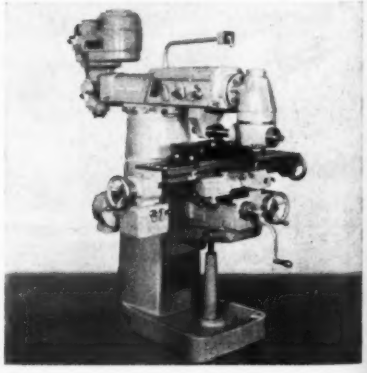
High Pressure Valve

A new 4-way valve of 1½", rated at 5000 psi, has joined the family of ¾" Denison valves. The valve is available as a thread, subplate or flange connected unit and can be operated either manually, mechanically or electrically. Five different spools provide for open, closed or partially blocked flow path connections at 90 gpm. Further information may be obtained from Denison Engineering Div., American Brake Shoe Co., 1160 Dublin Road, Columbus, Ohio, or circle Inform-A-Gram No. P31.



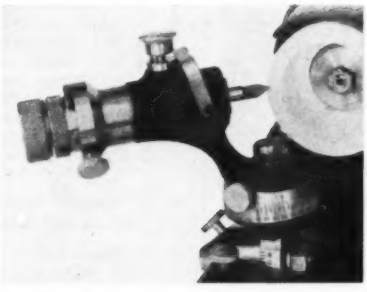
Quick Changes

A new turret type milling machine features a single head for horizontal milling with arbor mounted cutters. For vertical and angular milling the vertical spindle head is swiveled 180°. To save setup time, the machine can be equipped with any one of three different vertical heads on the opposite end of the overarm. Quick change from horizontal to vertical or angular milling can be made by loosening 4 bolts. The new machine is a member of the Toolmaster line from Cincinnati Milling Machine Co., 4701 Marburg Ave., Cincinnati 9, Ohio. Inform-A-Gram No. P32.



Cutter Grinder

Sharpening of single lip engraving and routing cutters can be done with a new universal cutter grinder. It's equipped with a cutter head that permits the operator to sharpen single lip cutters to any side angle or shape, including ball or round nose cutters. Accurate side clearances and tip or end rake are achieved without removing the cutter from the collet. The cutter head also has an index unit for grinding 2, 3 or 4 sided cutters. Cutter head graduations range from 0 to 90° for side angle, from 0 to 45° for side clearance and from 0 to 35° for tip or end rake. Depth of grinding is graduated in

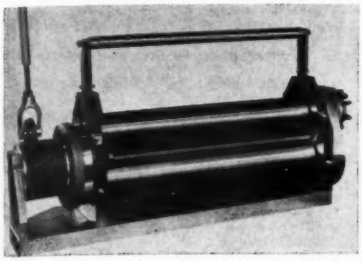


0.001" for accurate grinding of the cutter tip diameter. The cup shaped grinding wheel mounts directly on the 10,000 rpm ball bearing motor. Write H. P. Preis Engraving Machine Co., 284 U.S. Highway 22, Hillside, N.J. Inform-A-Gram No. P30.

Product News

Precision Roll Feed

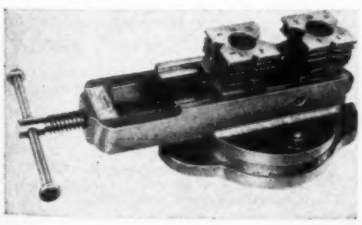
Series 9PRF precision roll feed features roller lengths suitable for 15" stock widths. The exceptional stroke length is obtained with a set of fully enclosed gears. The



feed is reversible with a new double width roller cam clutch. The clutch is credited with great repeat accuracy and freedom from wear. The brake can be adjusted during operation for correct resistance for feeding and smoother performance. Bottom feed roller is 3⅞" dia, and operates at up to 200 spm. Roll lifters are actuated by the roller bar across the top. The actuating bar swings 180° to either side when in operating position. Details and quotations from Benchmaster Mfg. Co., 1835 W. Rosencrans Ave., Gardena, Calif., or circle Inform-A-Gram No. P33.

Firm Grip

Super Vise, a new precision machine vise grips a variety of shaped materials. Multiform profiles are ground into the hardened tool-steel jaws to hold rounds, squares, flats, rectangles, angles, tees and tubing. The vise holds thin-wall tubing without distortion. Adaptability makes it ideal for production runs. C. H. Stoelting Co., 424 N. Homan Ave., Chicago 24, Ill. will elaborate, or circle Inform-A-Gram No. P34.



Every TOOL ROOM NEEDS THIS BIG Free REID CATALOG

Now big FREE 88 page catalog listing 2000 accessories and components needed in every tool room, such as malleable machine handles c.i. hand knobs, hand wheels, etc. All are top quality and low cost. Orders welcome for one or a thousand.

BALL HANDLES — THREADED

ROUND PLASTIC

OVA OVAL PLASTIC

MUSHROOM PLASTIC

Will give your product that "dressed-up" appearance. Made in a wide variety of diameters and thread sizes. Round and oval plastic supplied in red or black. Polished steel handles also supplied. Low prices and finest quality.

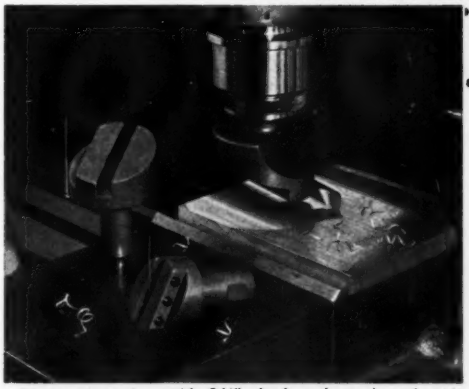
COMPRESSION SPRING ASSORTMENT

Available in many sizes ranging from 3/32" to 1-1/2" diameter. Made from music wire. All springs 10" long. Select the size required and cut to length wanted. Saves time and money.

Extension spring assortment, ranging in diameters from 1/8" to 1". All are 11" long. Low prices.

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 791



FLI-KUT
New - Improved
FLY-TOOL CUTTER HOLDER

$39.50 SET OF 3

3 convenient sizes with 3/4" shank and stand used with 5/16" carbide or high speed tool bits. Will machine up to 6" wide surface. NEW counterbalanced model allows faster speeds and feeds. Made of steel--hardened. Save on expensive end mills and sharpening cost. Better finishes. Write for Bulletin.

BUY FROM YOUR DEALER

CITY TOOL
DIE & MFG. CO., INC.
132 SPENCER AVE., SAN JOSE 10, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 792

DYKEM STEEL BLUE
Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 793

FASTER DIRECT READING ACCURACY
WITH THE TITAN DIAL VERNIER CALIPER

- Direct Reading accuracy to 0.001".
- Double Jaws for inside or outside measurement.
- Constructed entirely of brass and stainless steel for longer life.
- All working parts are completely enclosed.
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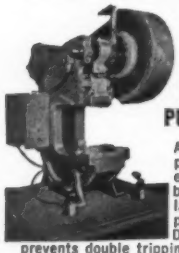

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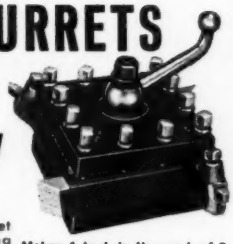

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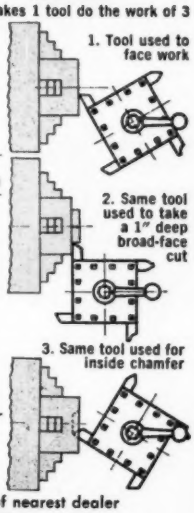

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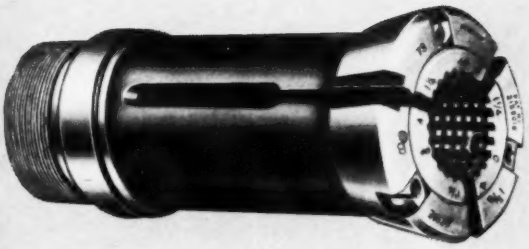

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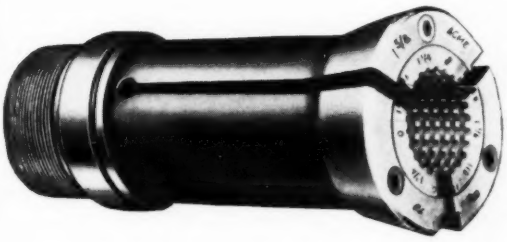

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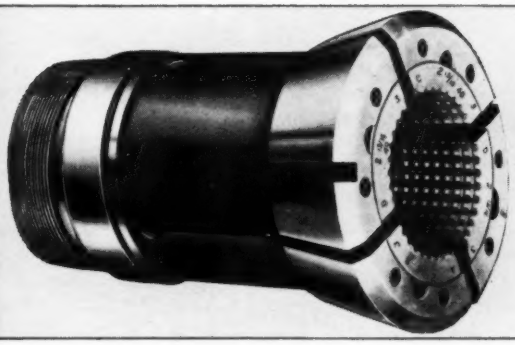

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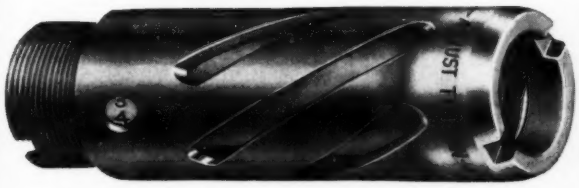

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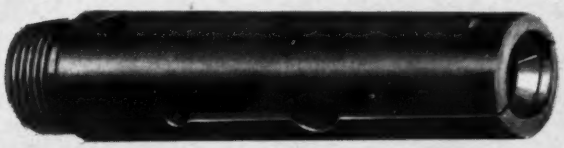

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